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## Cisco MDS 9100 Series Hardware Installation Guide

February 2010

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You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the Cisco equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the equipment to one side or the other of the television or radio.
- Move the equipment farther away from the television or radio.
- Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

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## New and Changed Information

This *Cisco MDS 9100 Series Hardware Installation Guide* applies to Cisco MDS SAN-OS Release 1.2(2a) and earlier Cisco MDS SAN-OS releases.

[Table 1](#) lists the new and changed features available with each supported Cisco MDS NX-OS release and SAN-OS release for the Cisco MDS 9100 Series, with the latest release first.



As of NX-OS Release 4.1(1b), SAN-OS has been changed to NX-OS. References to SAN-OS releases before 4.1(1b) still apply.

**Table 1** Documented Features for the Cisco MDS 9100 Series

Feature	Description	Changed in Release	Where Documented
The Cisco MDS 9148 Multilayer Fabric Switch support	The 48-port Cisco MDS 9148 Multilayer Fabric Switch.	5.0(1a)	<a href="#">Product Overview</a> chapter and <a href="#">Technical Specifications</a> appendix.
Cisco MDS Fibre Channel Blade Switch	Description of the Cisco MDS 8-Gb Fabric Switch for HP BladeSystem C-Class.	5.0(1a)	<a href="#">Product Overview</a> chapter.
Cisco 10-Gbps Ethernet X2 Transceivers	Added Cisco 10-Gbps Ethernet X2 Transceivers support.	4.2(1)	<a href="#">Technical Specifications</a> appendix
The new DC power supply	Description of removing and installing the new DC power supply.	Not release specific	<a href="#">Installing the Cisco MDS 9100 Series</a> chapter.
The Cisco MDS 9120 and the Cisco MDS 9140 switch support	Note that states that the Cisco MDS 9120 and the Cisco MDS 9140 Fibre Channel switches are not supported on NX-OS Release 4.1(1b).	4.1(1b)	<a href="#">Product Overview</a> chapter.
Cisco MDS Fibre Channel Bladeswitch overview	Description of the Cisco MDS Fibre Channel Blade switch for IBM BladeCenter.	3.3(1a)	<a href="#">Product Overview</a> chapter.

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**Table 1 Documented Features for the Cisco MDS 9100 Series (continued)**

Feature	Description	Changed in Release	Where Documented
Cisco MDS 9134 Switch overview	Description of NPIV support.	3.2(2c)	<a href="#">Product Overview</a> chapter.
Cisco MDS 9124 Switch overview	Description of NPIV support.	3.2(2c)	<a href="#">Product Overview</a> chapter.
Cisco MDS 9134 Switch overview	Description and illustrations of the 32-port 4-Gbps and 2-port 10-Gbps Cisco MDS 9134 Switch.	3.2(1)	<a href="#">Product Overview</a> chapter.
Cisco MDS 9134 Switch installation	Description and illustrations of installing the Cisco MDS 9134 Switch and removing it.	3.2(1)	<a href="#">Installing the Cisco MDS 9100 Series</a> chapter.
Cisco MDS 9134 Switch specifications	Switch specifications for the Cisco MDS 9134 Switch, including power supply requirements, heat dissipation specifications, and X2 Transceiver Specifications.	3.2(1)	<a href="#">Technical Specifications</a> appendix.
Cisco MDS 9124 Switch	Additional illustrations of the 24-port Cisco MDS 9124 Switch.	Not release specific	<a href="#">Installing the Cisco MDS 9100 Series</a> chapter.
Troubleshooting	Troubleshooting chapter removed.	Not release specific	For troubleshooting information, see the <a href="#">Cisco MDS 9000 Family Troubleshooting Guide</a> .
Cisco MDS 9124 Switch	The 24-port Cisco MDS 9124 Switch.	3.1(1)	This guide.
Rear-facing chassis installation	Chassis installation for a cabinet with insufficient front side clearance.	Not release specific	<a href="#">Installing the Switch in a Cabinet with Insufficient Front Clearance</a> , page 2-11.
Jumper power cord	Jumper power cord available for use in cabinet.	Not release specific	<a href="#">Jumper Power Cord</a> , page C-6.
Telco and EIA Shelf Bracket Kit	A 2-RU shelf bracket kit that allows single-user installation and installation in a Telco rack.	Not release specific	<a href="#">Cisco MDS 9000 Family Telco and EIA Shelf Bracket</a> , page A-3.
Console port to modem connection	Support for connecting the console port on the Cisco MDS 9100 Series to a modem.	1.2(2a)	<a href="#">Connecting the Console Port</a> , page 3-1.
Cisco MDS 9100 Series	The 20-port Cisco MDS 9120 Switch and the 40-port Cisco MDS 9140 Switch.	1.2(1a)	This guide.



## Preface

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This preface describes the audience, organization, and conventions of the *Cisco MDS 9100 Series Hardware Installation Guide*. It also provides information on how to obtain related documentation.

## Audience

To use this installation guide, you need to be familiar with electronic circuitry and wiring practices and preferably be an electronic or electromechanical technician.

## Organization

This guide is organized as follows:

Chapter	Title	Description
Chapter 1	<a href="#">Product Overview</a>	Provides an overview of the Cisco MDS 9100 Series Fixed Configuration Fabric Switch and its components.
Chapter 2	<a href="#">Installing the Cisco MDS 9100 Series</a>	Describes how to install the Cisco MDS 9100 Series, and includes how to install power supplies and fan modules.
Chapter 3	<a href="#">Connecting the Cisco MDS 9100 Series</a>	Describes how to connect the Cisco MDS 9100 Series switch.
Appendix A	<a href="#">Cabinet and Rack Installation</a>	Provides guidelines for selecting an enclosed cabinet, and the procedure for installing a switch using the optional Telco and EIA Shelf Bracket Kit.
Appendix B	<a href="#">Technical Specifications</a>	Lists the Cisco MDS 9100 Series switch specifications, and includes safety information, site requirements, and power connections.

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Chapter	Title	Description
Appendix C	<a href="#">Cable and Port Specifications</a>	Lists cable and port specifications for the Cisco MDS 9100 Series switch.
Appendix D	<a href="#">Site Planning and Maintenance Records</a>	Provides site planning and maintenance records.

## Document Conventions

Notes use the following conventions:



**Note**

Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the manual.

Cautions use the following conventions:



**Caution**

Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

Warnings use the following conventions:



**Warning**

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

**Waarschuwing**

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen. Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het document *Regulatory Compliance and Safety Information* (Informatie over naleving van veiligheids- en andere voorschriften) raadplegen dat bij dit toestel is ingesloten.

**Varoitus**

Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. Tässä julkaisussa esiintyvien varoitusten käännökset löydät laitteen mukana olevasta *Regulatory Compliance and Safety Information* -kirjasesta (määräysten noudattaminen ja tietoa turvallisuudesta).

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Attention	Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions d'avertissements figurant dans cette publication, consultez le document <i>Regulatory Compliance and Safety Information</i> (Conformité aux règlements et consignes de sécurité) qui accompagne cet appareil.
Warnung	Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Dokument <i>Regulatory Compliance and Safety Information</i> (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.
Avvertenza	Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento <i>Regulatory Compliance and Safety Information</i> (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo.
Advarsel	Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du være oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet <i>Regulatory Compliance and Safety Information</i> (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten.
Aviso	Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. Para ver as traduções dos avisos que constam desta publicação, consulte o documento <i>Regulatory Compliance and Safety Information</i> (Informação de Segurança e Disposições Reguladoras) que acompanha este dispositivo.
¡Advertencia!	Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. Para ver una traducción de las advertencias que aparecen en esta publicación, consultar el documento titulado <i>Regulatory Compliance and Safety Information</i> (Información sobre seguridad y conformidad con las disposiciones reglamentarias) que se acompaña con este dispositivo.

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**Varning!** Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. Se förklaringar av de varningar som förekommer i denna publikation i dokumentet *Regulatory Compliance and Safety Information* (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.

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## Related Documentation

The documentation set for the Cisco MDS 9000 Family includes the following documents. To find a document online, use the Cisco MDS NX-OS Documentation Locator at:

[http://www.cisco.com/en/US/docs/storage/san\\_switches/mds9000/roadmaps/doclocator.htm](http://www.cisco.com/en/US/docs/storage/san_switches/mds9000/roadmaps/doclocator.htm)

## Release Notes

- *Cisco MDS 9000 Family Release Notes for Cisco MDS NX-OS Releases*
- *Cisco MDS 9000 Family Release Notes for MDS SAN-OS Releases*
- *Cisco MDS 9000 Family Release Notes for Storage Services Interface Images*
- *Cisco MDS 9000 Family Release Notes for Cisco MDS 9000 EPLD Images*
- *Release Notes for Cisco MDS 9000 Family Fabric Manager*

## Regulatory Compliance and Safety Information

- *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*

## Compatibility Information

- *Cisco Data Center Interoperability Support Matrix*
- *Cisco MDS 9000 NX-OS Hardware and Software Compatibility Information and Feature Lists*
- *Cisco MDS NX-OS Release Compatibility Matrix for Storage Service Interface Images*
- *Cisco MDS 9000 Family Switch-to-Switch Interoperability Configuration Guide*
- *Cisco MDS NX-OS Release Compatibility Matrix for IBM SAN Volume Controller Software for Cisco MDS 9000*
- *Cisco MDS SAN-OS Release Compatibility Matrix for VERITAS Storage Foundation for Networks Software*

## Hardware Installation

- *Cisco MDS 9500 Series Hardware Installation Guide*

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- *Cisco MDS 9200 Series Hardware Installation Guide*
- *Cisco MDS 9124 and Cisco MDS 9134 Multilayer Fabric Switch Quick Start Guide*
- *Cisco MDS 9148 Multilayer Fabric Switch Quick Start Guide*

## Software Installation and Upgrade

- *Cisco MDS 9000 NX-OS Release 4.1(x) and SAN-OS 3(x) Software Upgrade and Downgrade Guide*
- *Cisco MDS 9000 Family Storage Services Interface Image Install and Upgrade Guide*
- *Cisco MDS 9000 Family Storage Services Module Software Installation and Upgrade Guide*

## Cisco NX-OS

- *Cisco MDS 9000 Family NX-OS Licensing Guide*
- *Cisco MDS 9000 Family NX-OS Fundamentals Configuration Guide*
- *Cisco MDS 9000 Family NX-OS System Management Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Fabric Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Quality of Service Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Security Configuration Guide*
- *Cisco MDS 9000 Family NX-OS IP Services Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Intelligent Storage Services Configuration Guide*
- *Cisco MDS 9000 Family NX-OS High Availability and Redundancy Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Inter-VSAN Routing Configuration Guide*

## Cisco Fabric Manager

- *Cisco Fabric Manager Fundamentals Configuration Guide*
- *Cisco Fabric Manager System Management Configuration Guide*
- *Cisco Fabric Manager Interfaces Configuration Guide*
- *Cisco Fabric Manager Fabric Configuration Guide*
- *Cisco Fabric Manager Quality of Service Configuration Guide*
- *Cisco Fabric Manager Security Configuration Guide*
- *Cisco Fabric Manager IP Services Configuration Guide*
- *Cisco Fabric Manager Intelligent Storage Services Configuration Guide*
- *Cisco Fabric Manager High Availability and Redundancy Configuration Guide*
- *Cisco Fabric Manager Inter-VSAN Routing Configuration Guide*
- *Cisco Fabric Manager Online Help*
- *Cisco Fabric Manager Web Services Online Help*

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## Command-Line Interface

- *Cisco MDS 9000 Family Command Reference*

## Intelligent Storage Networking Services Configuration Guides

- *Cisco MDS 9000 I/O Acceleration Configuration Guide*
- *Cisco MDS 9000 Family SANTap Deployment Guide*
- *Cisco MDS 9000 Family Data Mobility Manager Configuration Guide*
- *Cisco MDS 9000 Family Storage Media Encryption Configuration Guide*
- *Cisco MDS 9000 Family Secure Erase Configuration Guide*
- *Cisco MDS 9000 Family Cookbook for Cisco MDS SAN-OS*

## Troubleshooting and Reference

- *Cisco NX-OS System Messages Reference*
- *Cisco MDS 9000 Family NX-OS Troubleshooting Guide*
- *Cisco MDS 9000 Family NX-OS MIB Quick Reference*
- *Cisco MDS 9000 Family NX-OS SMI-S Programming Reference*
- *Cisco MDS 9000 Family Fabric Manager Server Database Schema*





# CHAPTER 1

## Product Overview

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The Cisco MDS 9100 Series Multilayer Fabric Switches provide an intelligent, cost-effective, and small-profile switching platform for small- and medium-sized storage environments. The Cisco MDS 9100 Series also provides full-feature capability with the Cisco MDS 9500 Series multilayer directors for a transparent, end-to-end service delivery in large data-center core-edge deployments.

The Cisco MDS 9100 Series includes four fixed configuration fabric switches:

- The Cisco MDS 9148 Multilayer Fabric Switch is a 48-port, 1-, 2-, 4-, and 8-Gbps autosensing Fibre Channel switch.
- The Cisco MDS 9134 Multilayer Fabric Switch is a 32-port, 1-, 2-, and 4-Gbps autosensing Fibre Channel and 2-port 10-Gbps switch.
- The Cisco MDS 9124 Multilayer Fabric Switch is a 24-port, 1-, 2-, and 4-Gbps autosensing Fibre Channel port switch.
- The Cisco MDS 9140 is a 40-port Fibre Channel switch.
- The Cisco MDS 9120 is a 20-port Fibre Channel switch.



**Note**

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The Cisco MDS 9120 and the Cisco MDS 9140 Fibre Channel switches are not supported on NX-OS Release 4.1(1b).

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The Cisco MDS 9100 Series is packaged in compact 1-RU enclosures with redundant hot-swappable power supplies. The Cisco MDS 9140 Switch, the Cisco MDS 9120 Switch, also include two hot-swappable fan modules. Management access is provided through 10/100 Ethernet for Cisco MDS 9134 switch. In the case of Cisco MDS 9148 switch, management access is provided through 10/100/1000 Ethernet, and serial console interfaces.

The Cisco MDS 9100 Series provides the following features:

- High port density at 48, 40, 32, 24, or 20 ports per 1 RU.
- Port interfaces that support field-replaceable, hot-swappable small form-factor pluggable (SFP) transceivers.



**Note**

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Throughout this document the term SFP will refer to both 4, 2, and 1 Gbps optics as well as SFP+ 8Gbps optics.

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- Redundant and hot-swappable power supplies for high availability.
- Hot-swappable fan modules in the Cisco MDS 9148 Switch, Cisco MDS 9140 Switch, Cisco MDS 9134 Switch, and the Cisco MDS 9120 Switch.

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- Front to back airflow.

**Note**

The airflow in the Cisco MDS 9148 Multilayer Fabric Switch flows from back to front; which is the opposite airflow direction from the other Cisco MDS 91xx Switches.

- Cisco MDS NX-OS multilayer intelligent software.
- Full compatibility with the Cisco MDS 9000 Family.

The Cisco MDS 9148 Multilayer Fabric Switch, Cisco MDS 9134 Multilayer Fabric Switch, and the Cisco MDS 9124 Multilayer Fabric Switch also provide the following features:

- On-Demand Port activation licensing that provides 8-, 16-, and 24-port configurations in the Cisco MDS 9124 Switch to optimize price and scalability. By default, the first 8 ports on the Cisco MDS 9124 Switch are licensed.
- On-Demand Port activation licensing provides 24 licensed ports by default in the Cisco MDS 9134 Switch. Port capacity can be increased on-site to 32 ports with an additional license. The 10 Gbps ports are also available through an additional license.
- On-Demand Port activation licensing provides 16, 32, or 48 licensed ports by default in the Cisco MDS 9148 Switch. Port capacity of 16 and 32 port models can be increased on-site to 48 ports with an additional license in 8 -port increments.
- Expansion of Cisco MDS 9134 Switches up to 64 ports or more is possible by using copper X2 CX4 transceivers or optical media.
- Quick configuration wizard that provides an easy-to-use interface allowing you to quickly enable server access to storage devices.

This chapter describes hardware information about the Cisco MDS 9100 Series and its components, and it includes the following sections:

- [Cisco MDS 9100 Series Multilayer Fabric Switches, page 1-2](#)
- [Cisco MDS Fibre Channel Blade Switch for IBM BladeCenter, page 1-6](#)
- [Power Supplies, page 1-7](#)
- [Fan Modules, page 1-8](#)
- [Cisco MDS 9100 Series Ports, page 1-9](#)
- [Switch LEDs, page 1-13](#)
- [Supported SFP and SFP+ Transceivers, page 1-16](#)

## Cisco MDS 9100 Series Multilayer Fabric Switches

This section describes the four Cisco MDS 9100 Series configurations:

- [Cisco MDS 9148 Switch, page 1-3](#)
- [Cisco MDS 9134 Switch, page 1-3](#)
- [Cisco MDS 9124 Switch, page 1-5](#)
- [Cisco MDS 9140 Switch, page 1-5](#)
- [Cisco MDS 9120 Switch, page 1-6](#)

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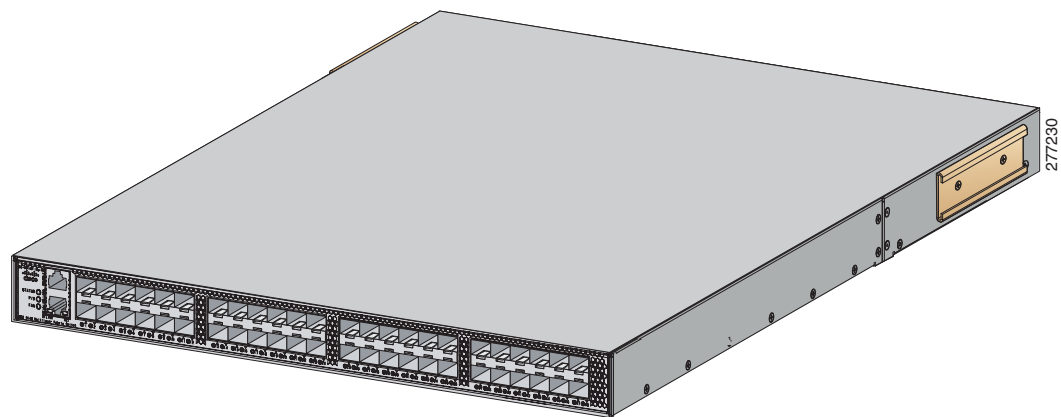
## Cisco MDS 9148 Switch

The Cisco MDS 9148 Switch offers 48 autosensing 1-, 2-, 4-, and 8-Gbps Fibre Channel ports. On the front panel, there are four 12-port groups that are connected to a crossbar and a central arbiter system, which offer 1-, 2-, 4-, and 8-Gbps Fibre Channel ports. In addition, the Cisco MDS 9148 Switch offers a CPU port and an Interlaken port for the network processor connectivity. The Cisco MDS 9148 Switch features On-Demand Port Licensing. You can activate licensing in 8-port increments with each on-demand port activation license for up to a total of 48 ports. There are three pre-configured models of the Cisco MDS 9148 Multilayer Fabric Switch available. These models enable 16, 32 or 48 ports. The 16 and 32 models can be upgraded up to 48 ports with the 8-port upgrade license. See [Figure 1-1](#).

The Cisco MDS 9148 Switch supports N port identifier virtualization (NPIV). NPIV can assign multiple FC IDs to a single N port. This feature allows multiple applications on the N port to use different identifiers and allows access control, zoning, and port security at the application level.

In NPIV mode, the Cisco MDS 9148 switch supports F-Port Trunking (for VSANs) and F-Port PortChannel (for ISLs). Additionally, the Cisco MDS 9148 switch also supports Cisco N-Port Virtualization (NPV) to enable scaling of SANs without reaching Fibre Channel Domain ID limits.

**Figure 1-1** Cisco MDS 9148 Switch



## Cisco MDS 9134 Switch

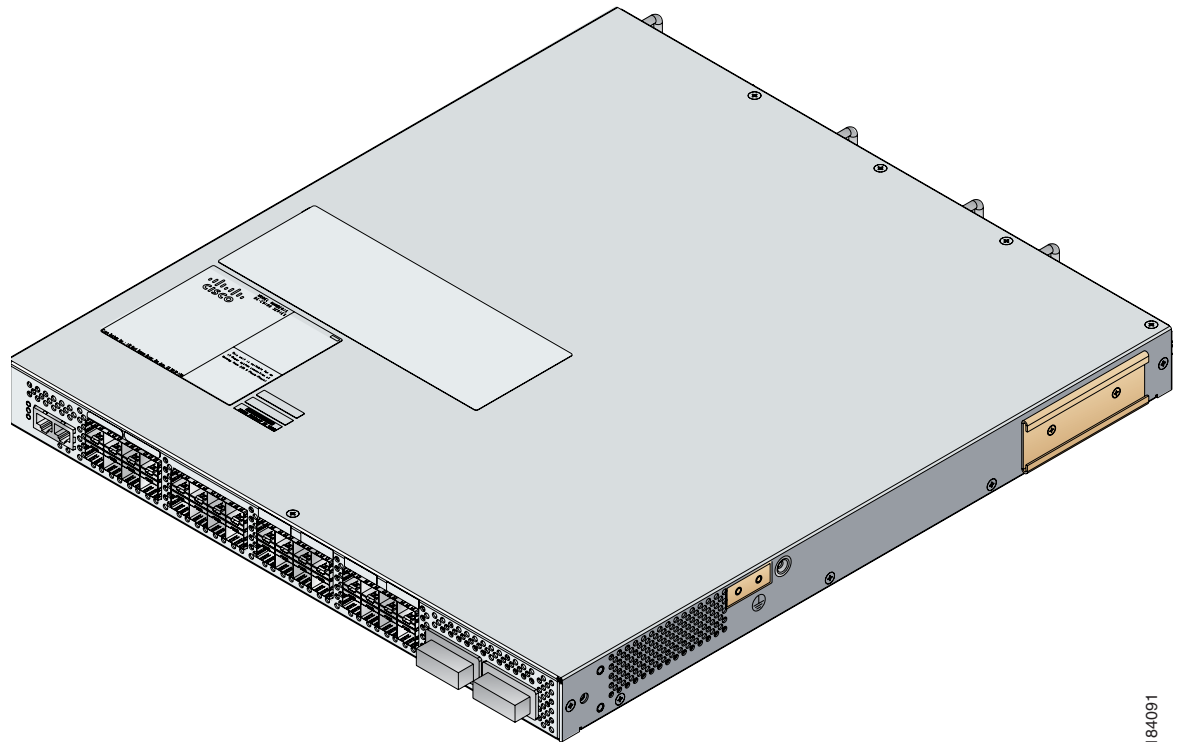
The Cisco MDS 9134 Multilayer Fabric Switch has a total of 32 1-, 2-, and 4-Gbps autosensing Fibre Channel ports, and 2 10-Gbps ports. The Cisco MDS 9134 Switch (see [Figure 1-2](#)) features On-Demand Port activation licensing. By default, the first 24 ports are licensed. An additional license is required for the remaining 8 ports. The 2 10-Gbps ports are not licensed by default. They require a separate license.

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The 10-Gbps Fibre Channel ports of the Cisco MDS 9134 Switches can be used as Inter-Switch Link (ISL) ports for multiple Cisco MDS 9134 Switches. In addition, the 10-Gbps ports on the Cisco MDS 9134 Switch can be configured as ISLs for larger MDS switches on which the DS-X9704 module is installed. The 10-Gbps interfaces support the copper CX4 X2 transceivers and optical media. For more information, see the “[Installing Cisco MDS 9134 48-Port and 64-Port Bundles](#)” section on page 2-21.

Cisco MDS 9134 Multilayer Fabric Switch supports N port identifier virtualization (NPIV). NPIV can assign multiple FC IDs to a single N port. This feature allows multiple applications on the N port to use different identifiers and allows access control, zoning, and port security at the application level.

**Figure 1-2** Cisco MDS 9134 Switch



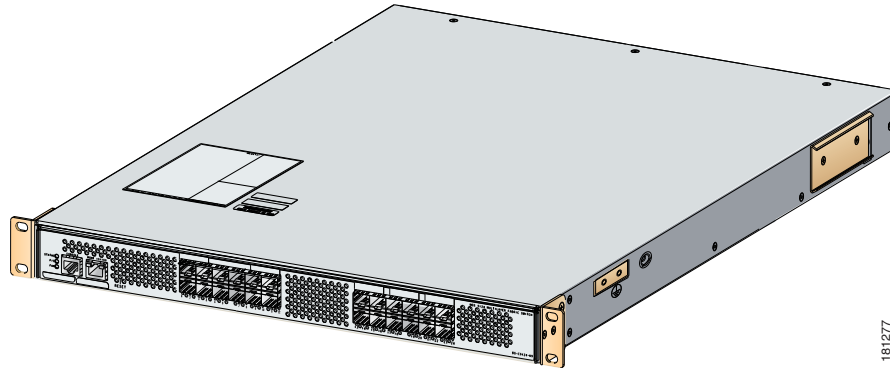
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## Cisco MDS 9124 Switch

The Cisco MDS 9124 Multilayer Fabric Switch has a total of 24 1-, 2-, and 4-Gbps autosensing Fibre Channel ports. The Cisco MDS 9124 Switch features On-Demand Port Licensing. You can activate licensing in 8-port increments with each on-demand port activation license for up to a total of 24 ports. By default, the first 8 ports are licensed. Two additional licenses are required to license all 24 ports. See [Figure 1-3](#).

**Figure 1-3** Cisco MDS 9124 Switch

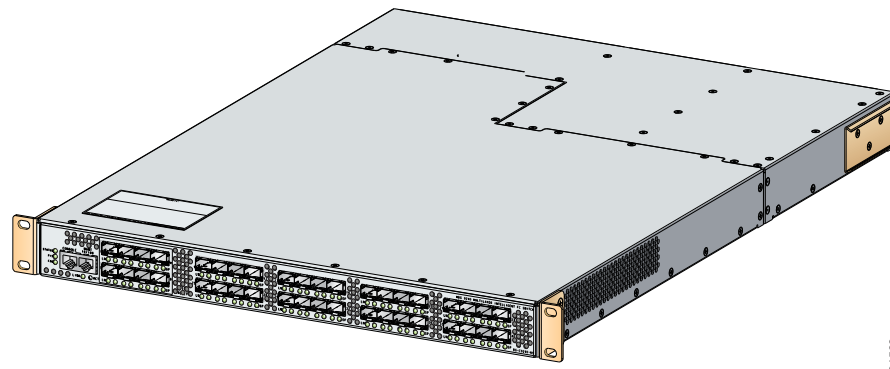


Cisco MDS 9124 Multilayer Fabric Switch supports N port identifier virtualization (NPIV). NPIV can assign multiple FC IDs to a single N port. This feature allows multiple applications on the N port to use different identifiers and allows access control, zoning, and port security at the application level.

## Cisco MDS 9140 Switch

The Cisco MDS 9140 Switch has a total of 40 1/2-Gbps autosensing, optionally configurable ports. The first eight ports on the left-hand side are the bandwidth-optimized ports. They are delineated by a white border. The remaining eight groups of four ports each are the host-optimized port groups. See [Figure 1-4](#).

**Figure 1-4** Cisco MDS 9140 Switch

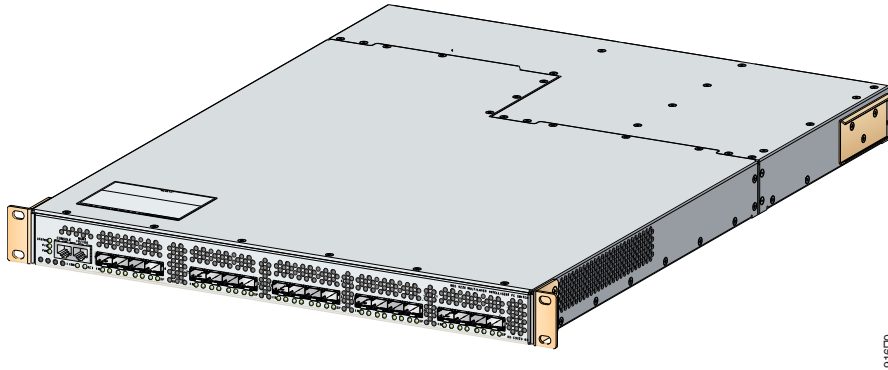


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## Cisco MDS 9120 Switch

The Cisco MDS 9120 Switch has a total of 20 1/2-Gbps autosensing, optionally configurable ports. The first group of four ports on the left-hand side are the bandwidth-optimized ports. They are delineated by a white border. The remaining four groups of four ports each are the host-optimized port groups. See [Figure 1-5](#).

**Figure 1-5** Cisco MDS 9120 Switch



## Cisco MDS Fibre Channel Blade Switch for IBM BladeCenter

The Cisco MDS Fibre Channel Bladeswitch for IBM BladeCenter is designed for IBM BladeCenter environments. The Cisco MDS Fibre Channel Blade Switch is based on the Cisco MDS 9000 Family SAN switching technology, which integrates the Cisco MDS 9000 Family of switches and directors into a blade-switch architecture. The advanced architecture of the Cisco MDS Fibre Channel Blade Switch for IBM BladeCenter, along with 4-Gbps technology, provides outstanding performance between blade switches and the rest of the Fibre Channel infrastructure.

The Cisco MDS Fibre Channel Blade Switch for IBM BladeCenter provides 4-Gbps Fibre Channel performance to blade-server switching. It also provides network intelligence features such as virtual SANs (VSANs), quality of service (QoS), and N-port identifier virtualization (NPIV). It also offers nondisruptive software upgrades and on-demand port activation and is the most complete embedded Fibre Channel switching available for the IBM BladeCenter, BladeCenter-T, and BladeCenter-H platforms.

The Cisco MDS Fibre Channel Blade Switch for IBM BladeCenter provides up to 20 nonblocking 1-, 2-, and 4-GB Fibre Channel ports that are available in two configurations: 7 internal ports and 3 external ports, or 14 internal ports and 6 external ports. Each port provides line-rate performance up to 4-Gbps without any performance loss for integrated features such as VSANs, QoS, or Network Address Translation (NAT). The Cisco MDS Fibre Channel Blade Switch for IBM BladeCenter supports up to 16 VSANs per blade switch.

Each external port on the Cisco MDS FC Blade Switch for IBM BladeCenter also provides line-rate performance up to 4-Gbps for Inter-Switch Links (ISLs) or additional device connectivity such as storage or host bus adapters (HBAs).

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The Cisco NX-OS software provides role-based access control (RBAC) for management access of the Cisco Fibre Channel Blade Switch for IBM BladeCenter command-line interface (CLI) and Simple Network Management Protocol (SNMP). For more information, see the *Cisco MDS 9000 Family Command Reference*.

## Cisco MDS 8-Gb Fabric Switch for HP BladeSystem C-Class

The Cisco MDS 8-Gb Fabric Switch is designed for the HP BladeSystem C-Class. The Cisco MDS 8-Gb Fabric Switch is a 24-port switch, with 8-Gbps of dedicated bandwidth for each port. The Cisco MDS 8-Gb Fabric Switch offers intelligent storage networking capabilities such as virtual SANs (VSANs), PortChannels, quality of service (QoS), high availability, and security. In addition, it supports key features such as N port virtualization (NPV), N port interface virtualization (NPIV), FlexAttach, and F port trunking.

The Cisco MDS 8-Gb Fabric Switch offers nondisruptive software upgrades, up to 16 VSANs per switch for fault isolation, and PortChannels for Inter-Switch Link (ISL) resiliency. The PortChannels allow users to aggregate up to 16 physical ISLs into a single logical bundle, providing optimized bandwidth use across all links.

The Cisco MDS 8-Gb Fabric Switch has 8 1-, 2-, 4-, and 8-Gbps SFP ports at the front panel and has 16 2-, 4-, and 8-Gbps serdes connections to the backplane. The 16 ports are internal for server connections and 8 ports are external or SAN facing. The Cisco MDS 8-Gb Fabric Switch ports are grouped. Each port group consists of 4 ports.

The Cisco MDS 8-Gb Fabric Switch external ports include hot-swappable, Small Form-Factor Pluggable (SFP) line card interfaces. All SFP interfaces are 1, 2, 4, and 8 Gbps, with autosensing capabilities. Individual ports can be configured with either short- or long-wavelength SFP optics for connectivity of up to 500 meters (m) and 10 kilometers (km), respectively.

The Cisco MDS 8-Gb Fabric Switch comes with the on-demand port activation license, which can be expanded in 8-port increments.

The Cisco NX-OS software provides role-based access control (RBAC) for management access of the Cisco MDS 8-Gb Fabric Switch command-line interface (CLI) and Cisco Fabric Manager, a centralized management tool that simplifies management of a standalone switch or multiple switches and fabrics. For more information about Cisco 9000 Family commands, see the *Cisco MDS 9000 Family Command Reference*.

## Power Supplies

The Cisco MDS 9100 Series supports dual AC and DC power supplies. Each power supply provides sufficient power to maintain switch operation in the event of a single power supply failure. Power supplies are hot swappable and can be individually replaced without disruption to the system. (See the [“Power Specifications” section on page B-3.](#))



### Note

The new DC power supply is not supported on the Cisco MDS 9148 Switch, Cisco MDS 9140 Switch, and the Cisco MDS 9120 Switch.

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**Caution**

Power supplies for the Cisco 9100 Series look similar but they differ slightly. Be sure to use the correct power supply designated for your Cisco 9100 Series switch. Using an incorrect power supply will not provide redundant power in the case of a power supply failure.

The power supply has two LEDs, AC ok and DC ok. Power supply status is also indicated on a front panel LED.

Procedures for replacing and installing the power supplies are available in the [“Removing and Installing Components” section on page 2-25](#).

The Cisco MDS 9124 Switch includes a front panel reset button that resets the switch without cycling the power.

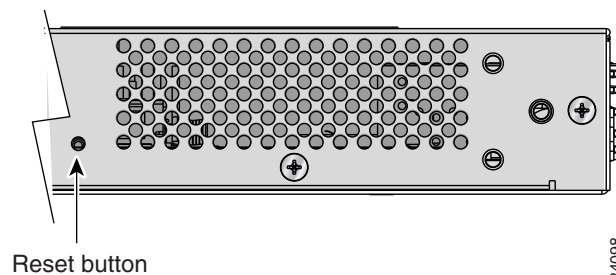
**Note**

If the Cisco MDS 9124 switch has only one power supply and supports SAN-OS Release 3.3(x), the normal FAN LED indication is Amber light.

If the Cisco MDS 9124 switch has only one power supply and supports NX-OS Release 4.1(x) or later, the normal FAN LED indication is Green light.

The Cisco MDS 9134 Switch includes a reset button on the left side of the switch as shown in [Figure 1-6](#).

**Figure 1-6** Reset Button on the Side of the Cisco MDS 9134 Switch



## Fan Modules

The Cisco MDS 9148 Switch, Cisco MDS 9140 Switch, the Cisco MDS 9134 Switch, and the Cisco MDS 9120 Switch support two hot-swappable fan modules that allow the switches to continue to run if a fan module fails, or is removed or both. The switches would continue to run provided the preset temperature thresholds have not been exceeded. You can swap out a fan module without having to bring the system down. Each fan module on the Cisco MDS 9134 Switch and Cisco MDS 9148 Switch has two fans. The Cisco MDS 9124 Switch includes three fixed fans and an additional fan in each removable power supply. For normal operation, the Cisco MDS 9124 Switch requires four fans.

**Caution**

The Cisco MDS 9000 Family has internal temperature sensors that are capable of shutting down the system if the temperature at different points within the chassis exceed certain safety thresholds. To be effective, the temperature sensors require the presence of airflow; therefore, in the event a fan module is removed from the chassis, the Cisco MDS 9140 Switch and the Cisco 9120 Switch will shut down after five minutes to prevent potentially undetectable overheating. However, the switches will shut down



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sooner if the higher-level temperature threshold is exceeded. For normal operation, the Cisco MDS 9124 Switch requires four fans. When fewer than four fans are operating on the Cisco MDS 9124 Switch, the switch will shut down.

Except for the Cisco MDS 9148 Switch, Cisco MDS 9134 Switch, the fan modules each have one Status LED. The Cisco MDS 9134 Switch and the Cisco MDS 9148 Switch fan modules do not have a Status LED. Fan module status is also indicated on a front panel LED.

Procedures for replacing and installing the fan modules are available in the “[Removing and Installing Components](#)” section on page 2-25.

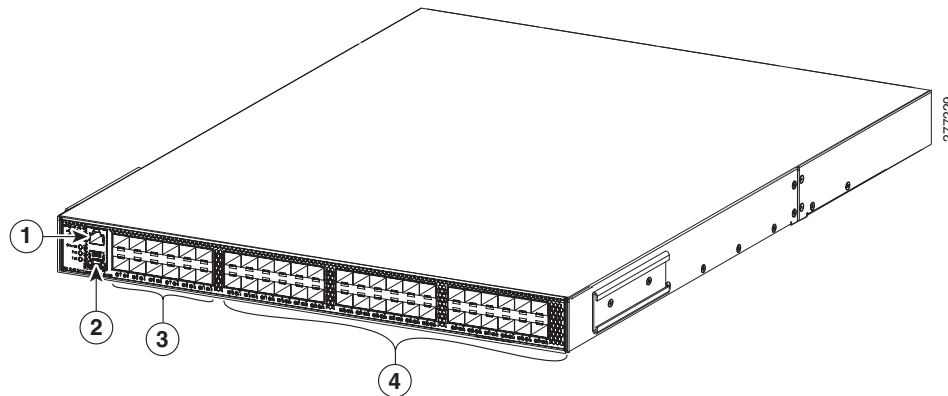
## Cisco MDS 9100 Series Ports

The Cisco MDS 9100 Series provides host, target, and Inter-Switch Link (ISL) connectivity.

### Ports on the Cisco MDS 9148 Switch

The Cisco MDS 9148 Switch provides up to 48 autosensing and autonegotiating Fibre Channel ports capable of speeds of 1, 2, 4, and 8 Gbps. By default, the Cisco MDS 9148 Switch may have 16, 32 or 48 ports enabled. On-Demand Port Activation Licensing allows expansion to 48 ports, with additional ports available in 8-port increment. [Table 1-1](#) shows the mapping of ports to port groups.

**Figure 1-7** Cisco MDS 9148 Ports



1	Console port	3	16 default licensed ports
2	10/100/1000 Ethernet management port	4	32 on-demand ports

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**Note**

If a port or optical transceiver fails, you can disable that licensed port and assign the port license to another unused available port for recovery resiliency. You can re-assign the licensed ports to any of the 48 physical ports (up to the permitted number of licensed ports).

**Table 1-1** Port Group Mapping on the Cisco MDS 9148 Switch

Ports	Port Group
Front panel fc1/33–36	Port group 0
Front panel fc1/29–32	Port group 1
Front panel fc1/25–28	Port group 2
Front panel fc1/45–48	Port group 3
Front panel fc1/41–44	Port group 4
Front panel fc1/37–40	Port group 5
Front panel fc1/9–12	Port group 6
Front panel fc1/5–8	Port group 7
Front panel fc1/1–4	Port group 8
Front panel fc1/21–24	Port group 9
Front panel fc1/17–20	Port group 10
Front panel fc1/13–16	Port group 11

All 48 8-Gbps ports can operate at line rate concurrently.

## Ports on the Cisco MDS 9134 Switch

The Cisco MDS 9134 Switch provides up to 32 autosensing and autonegotiating Fibre Channel ports capable of speeds of 1, 2, and 4 Gbps. The first 24 ports are licensed by default. On-Demand Port Activation Licensing allows expansion to 32 ports, with additional ports available as an 8-port group. The Cisco MDS 9134 Switch also offers two 10-Gbps ports. [Table 1-2](#) shows the mapping of ports to port groups.

**Table 1-2** Port Group Mapping on the Cisco MDS 9134 Switch

Ports	Port Group
Front panel fc1/1–4	Port group 0
Front panel fc1/5–8	Port group 1
Front panel fc1/9–12	Port group 2
Front panel fc1/13–16	Port group 3
Front panel fc1/17–20	Port group 4
Front panel fc1/21–24	Port group 5
Front panel fc1/25–28	Port group 6

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**Table 1-2 Port Group Mapping on the Cisco MDS 9134 Switch**

Ports	Port Group
Front panel fc1/29–32	Port group 7
10-Gbps ports	Port group 8 and 9

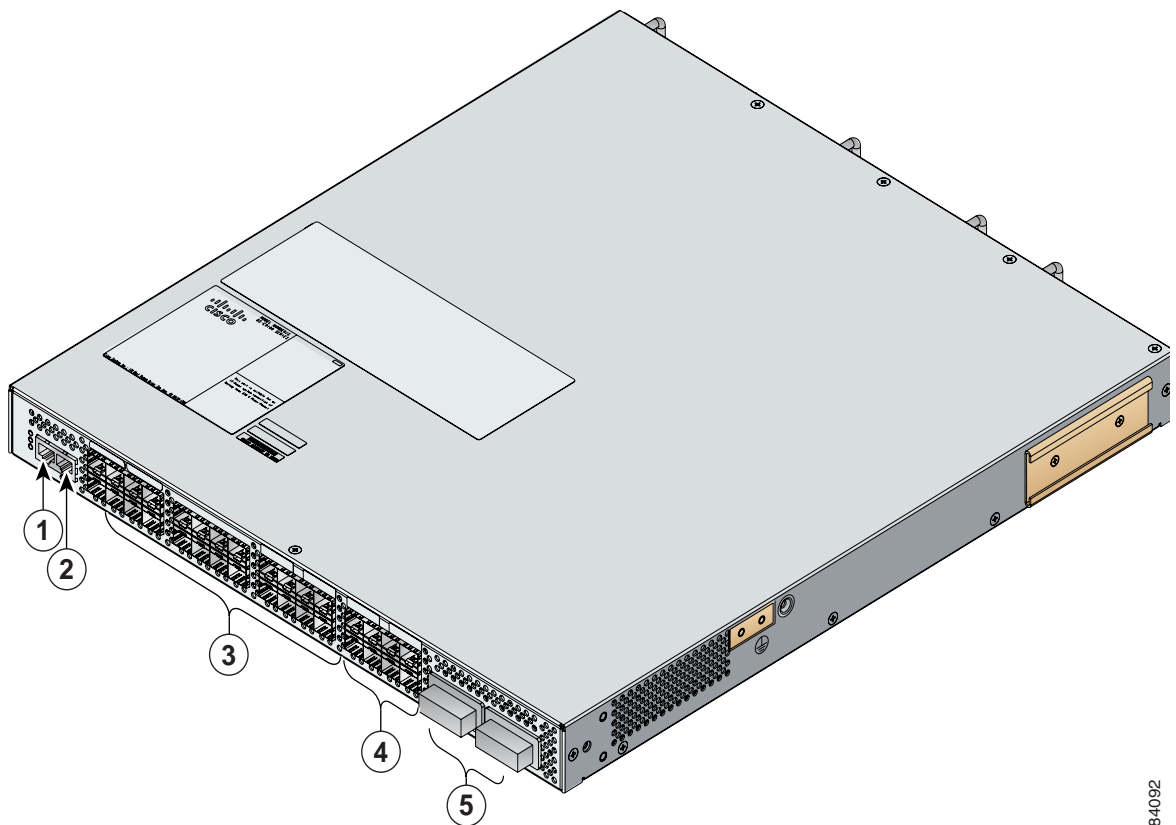
All 32 4-Gbps ports and 2 10-Gbps ports can operate at line rate concurrently. In addition, the 10-Gbps ports can be activated independently at 24- or 32-port configurations.

A 64-port switch can be formed out of Cisco two MDS 9134 Switches by using a copper CX4 X2 transceiver as an Inter-Switch Link (ISL).

The Cisco MDS 9134 Switch includes hot-swappable SFP interfaces. All SFP interfaces are 1, 2, and 4 Gbps, with autosensing capabilities. Individual ports can be configured with either short- or long-wavelength SFP optics for connectivity up to 860 meters and 10 kilometers, respectively. The two 10-Gbps ports support X2 form factor optics, either copper or optical.

Figure 1-8 shows the Cisco MDS 9134 ports.

**Figure 1-8 Cisco MDS 9134 Ports**



1	Console port	4	8 on-demand ports
2	10/100 Ethernet management port	5	2 10-Gbps ports
3	24 default licensed ports		

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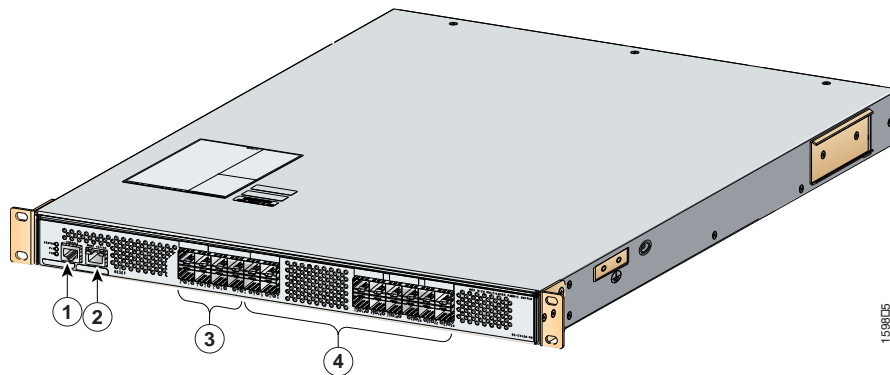
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## Ports on the Cisco MDS 9124 Switch

The Cisco MDS 9124 Switch has 24 1-, 2-, and 4-Gbps autosensing and autonegotiating Fibre Channel ports with on-demand port activation licensing.

The on-demand ports are licensed in groups of eight. By default, an on-demand license for the first eight ports (ports 1 through 8) is included with the switch. You can transfer that license to other ports on the switch or obtain extra licenses to make more ports on the switch available. You can activate additional ports in 8-port increments with each on-demand port license. To purchase additional on-demand port licenses, contact your customer service representative and refer to Part Number M9124PL8-4G=. See [Figure 1-9](#).

**Figure 1-9** Cisco MDS 9124 Ports



1	Console port	3	8 default licensed ports
2	10/100 Ethernet management port	4	16 on-demand ports

## Ports on the Cisco MDS 9140 Switch and the Cisco MDS 9120 Switch

On the Cisco MDS 9140 Switch and the Cisco MDS 9120 Switch, bandwidth optimized ports are on the left side of the front panel, surrounded by a white border. These ports are best used for applications requiring very high bandwidth: for example, ISL connections between switches and high-performance host or target controllers. These ports support a sustained data rate of up to 2 Gbps in each direction, on all ports simultaneously.

Host-optimized ports are best for all but the most bandwidth intensive connections and are typically used to connect host devices (servers) to the SAN. These ports are organized into four port groups.

The four ports within a port group share access to a single internal channel resulting in a subscription ratio of approximately 3.2:1.



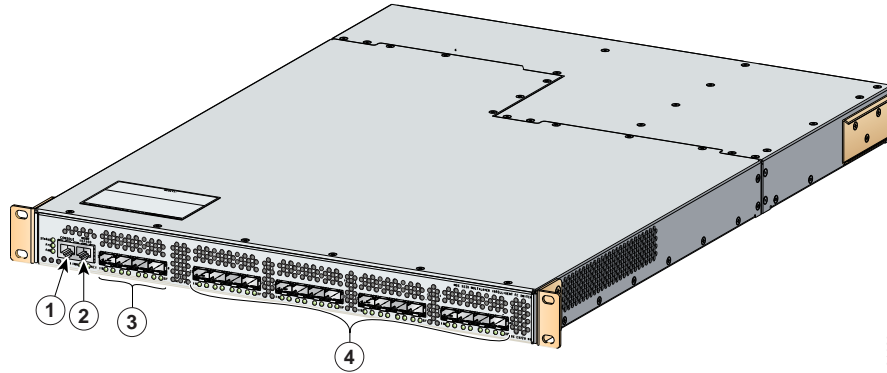
### Tip

For full 2-Gbps bandwidth between two devices using host-optimized ports, connect one device to the first port group and connect the second device to the second port group.

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Only the first port in each four-port group can be an ISL. If the first port is an ISL, the other three ports in the group are disabled. See [Figure 1-10](#).

**Figure 1-10 Cisco MDS 9140 and Cisco MDS 9120 Switch Ports**

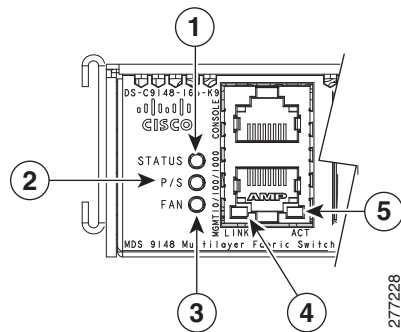


1	Console port	3	Bandwidth optimized switching ports
2	10/100 Ethernet management port	4	Host-optimized switching port groups

## Switch LEDs

The front panel of the Cisco MDS 9100 Series includes the LEDs shown in [Figure 1-11](#), [Figure 1-12](#), [Figure 1-13](#), and [Figure 1-14](#). You can use the LEDs on this panel to quickly identify system status.

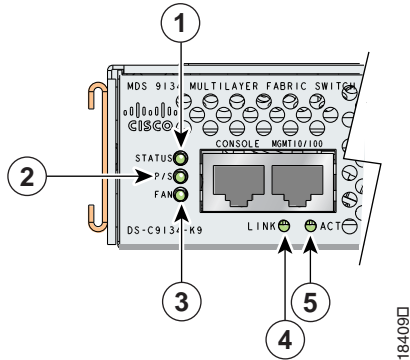
**Figure 1-11 Cisco MDS 9148 Switch LEDs**



1	Switch status LED	4	10/100/1000 Ethernet management port activity LED
2	Power supply LED	5	Top port link LED
3	Fan module status LED	6	Port activity LED

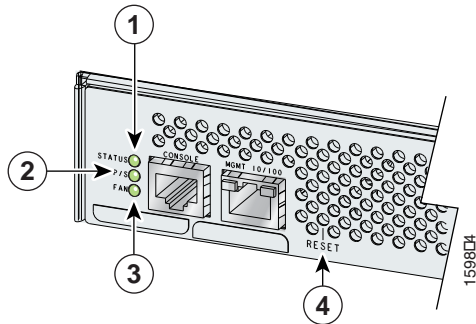
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Figure 1-12 Cisco MDS 9134 Switch LEDs



1	Switch status LED	4	10/100 Ethernet management port link LED
2	Power supply LED	5	10/100 Ethernet management port activity LED
3	Fan module status LED		

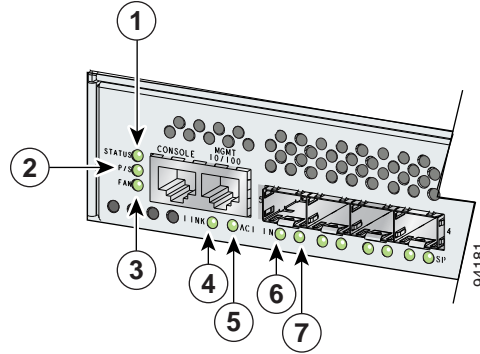
Figure 1-13 Cisco MDS 9124 Switch LEDs



1	Switch status LED	3	Fan module status LED
2	Power supply LED	4	Reset button

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Figure 1-14 Cisco MDS 9140 Switch and Cisco MDS 9120 Switch LEDs



1	Switch status LED	5	10/100 Ethernet management port activity LED
2	Power supply LED	6	Top port link LED
3	Fan module status LED	7	Bottom port link LED
4	10/100 Ethernet management port link LED		

Table 1-3 describes the front panel LEDs for the Cisco MDS 9100 Series.

Table 1-3 Switching Module LEDs

LED	Status	Description
Switch status	Green	All diagnostics pass. The module is operational (normal initialization sequence).
	Orange	The module is booting or running diagnostics (normal initialization sequence). Switch temperature is high. (A minor threshold was exceeded during environmental monitoring.)
	Red	The diagnostic test failed. The module is not operational because a fault occurred during the initialization sequence. Switch overheated. (A major threshold was exceeded during environmental monitoring.)
Power supply status	Green	Both power supplies are working.
	Orange	One power supply has failed or has been removed.
	Red or all LEDs off	Both power supplies have failed.
Fan module status	Green	Both fan modules are working properly.
	Orange	One of the fan modules has failed.
	Red	Both fan modules have failed.
Management port link	Intermittent flashing green	Traffic is on the management port.
Management port activity	Green	Management port is active.
	Red	Management port is not active.

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**Table 1-3 Switching Module LEDs (continued)**

LED	Status	Description
Port speed	On	2-Gbps mode.
	Off	1-Gbps mode.
Port link	Solid green	Link is up.
	Steady flashing green	Link is up (beacon used to identify port). <sup>1</sup>
	Intermittent flashing green	Link is up (traffic on port).
	Solid orange	Link is disabled by software.
	Flashing orange	A fault condition exists.

1. The flashing green light turns on automatically when an external loopback is detected that causes the interfaces to be isolated. The flashing green light overrides the beacon mode configuration. The state of the LED is restored to reflect the beacon mode configuration after the external loopback is removed.

## Supported SFP and SFP+ Transceivers

The following types of SFP transceivers are available from Cisco Systems and are supported on the Cisco MDS 9100 Series:

- Fibre Channel SFP transceivers, in either short wavelength (SWL) or long wavelength (LWL)
- Combination Fibre Channel/Gigabit Ethernet SFP transceivers, in either SWL or LWL
- Combination Fibre Channel/Gigabit Ethernet coarse wavelength division multiplexers (CWDM) SFP transceivers, which can be used for extended long wavelength (ELWL) transmission or for CWDM
- Combination Fibre Channel/Gigabit Ethernet dense wavelength division multiplexers (DWDM)



### Note

Switches running Cisco MDS SAN-OS Release 1.1(1a) or later and MDS NX-OS Release 4.1(1b) or later support combination Fibre Channel/Gigabit Ethernet SFP transceivers.

SFP transceivers are field-replaceable. You can use any combination of SFP transceivers that are supported by the switch. The only restrictions are that SWL transceivers must be paired with SWL transceivers, and LWL transceivers with LWL transceivers, and the cable must not exceed the stipulated cable length for reliable communications.

SFP transceivers can also be used in extended distances, but it would depend on the allocation of available Buffer-To-Buffer (B2B) credits on specific ports in the switch. For more information on Buffer-to-Buffer (B2B) credits, see the *Configuring Interface Buffers* chapter in the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide*.

For the list of supported SFP transceivers, see the *Cisco MDS 9000 Family Release Notes for Cisco MDS NX-OS Releases*. For more information about a specific Cisco SFP transceiver, see the “[SFP Transceiver Specifications](#)” section on page B-6. SFP transceivers can be ordered separately or with the Cisco MDS 9100 Series.



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**Note**

Use only Cisco SFP transceivers on the Cisco MDS 9100 Series. Each Cisco SFP transceiver is encoded with model information that enables the switch to verify that the SFP transceiver meets the requirements for the switch.

## Fibre Channel SFP Transceivers

Cisco Fibre Channel SFP transceivers are available in SWL or LWL versions. Both versions are 1-Gbps/2-Gbps/4-Gbps/8-Gbps capable. The Cisco MDS 9124 Switch and the Cisco MDS 9134 Switch support 4-Gbps Fibre Channel SFP transceivers. The Cisco MDS 9148 Switch supports both the 4-Gbps and 8-Gbps Fibre Channel SFP transceivers.

Cisco Fibre Channel SFP transceivers have LC connectors and comply with 1-, 2-, -4, and 8 Gbps Fibre Channel standards as defined in FC-PI 10.0 2 and FC-PI-4.

Transmission ranges for 2 Gbps are as follows:

- Long wavelength: Up to 6.2 miles (10 km) on 9-micron single-mode fiber
- Short wavelength: Up to 328 yards (300 m) on 50-micron multi-mode fiber
- Short wavelength: Up to 164 yards (150 m) on 62.5-micron multi-mode fiber

Transmission ranges for 4 Gbps are as follows:

- Long wavelength: Up to 6.2 miles (10 km) on 9-micron single-mode fiber
- Short wavelength: Up to 546 yards (500 m) on 50-micron multi-mode fiber
- Short wavelength: Up to 328 yards (300 m) on 62.5-micron multi-mode fiber

Transmission ranges for 8 Gbps are as follows:

- Long wavelength: Up to 6.2 miles (10 km) on 9-micron single-mode fiber
- Short wavelength: Up to 546 yards (500 m) on 50-micron multi-mode fiber
- Short wavelength: Up to 264 yards (150 m) on 62.5-micron multi-mode fiber

For transceiver specifications, see [Appendix C, “Cable and Port Specifications.”](#)

## Combination Fibre Channel/Gigabit Ethernet SFP Transceivers

The combination Fibre Channel/Gigabit Ethernet SFP transceivers from Cisco Systems are available in SWL or LWL versions for the Cisco MDS 9140 Switch and the Cisco MDS 9120 Switch. Both versions are 1-Gbps and 2-Gbps capable.

The combination SFP transceivers from Cisco Systems have LC connectors and comply with 1-Gbps and 2-Gbps Fibre Channel as defined in FC-PI 10.0 2 and Gigabit Ethernet as defined in IEEE 802.3z.

Transmission ranges are as follows:

- Long wavelength: Up to 6.2 miles (10 km) on 9-micron single mode fiber
- Short wavelength: Up to 328 yards (300 m) on 50-micron multi-mode fiber
- Short wavelength: Up to 164 yards (150 m) on 62.5-micron multi-mode fiber

For transceiver specifications, see [Appendix C, “Cable and Port Specifications.”](#)

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## CWDM Combination Fibre Channel/Gigabit Ethernet SFP Transceivers

All Fibre Channel and Gigabit Ethernet ports in the Cisco MDS 9100 Series support CWDM SFP transceivers.

The Cisco CWDM SFP transceivers have LC connectors and support both Gigabit Ethernet and Fibre Channel (1-Gbps / 2-Gbps). They match the wavelength plan of Cisco CWDM GBICs and Cisco CWDM optical add/drop multiplexers (OADMs).

CWDM SFP transceivers can be used in two ways:

- CWDM transmission can send and receive up to eight laser wavelengths carrying different signals simultaneously on the same optical fiber, using an OADM.
- ELWL signals can transmit over longer distances than LWL SFP transceivers.

There are eight different “colors” of CWDM SFP transceivers, one for each fixed wavelength. The fiber-optic cables from the CWDM SFP transceivers must be connected to an OADM, which combines the wavelengths of the different outgoing signals into one composite send signal, and separates the received transmissions into the different wavelengths and sends them to the corresponding CWDM SFP transceiver.

For detailed transceiver specifications, see [Appendix C, “Cable and Port Specifications.”](#)



## CHAPTER 2

# Installing the Cisco MDS 9100 Series

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This chapter describes how to install the Cisco MDS 9100 Series and its components, and it includes the following information:

- [Preinstallation, page 2-2](#)
- [Installing the Switch in a Cabinet or Rack, page 2-5](#)
- [Installing the Switch in a Cabinet with Insufficient Front Clearance, page 2-11](#)
- [Installing Cisco MDS 9134 48-Port and 64-Port Bundles, page 2-21](#)
- [Grounding the Switch, page 2-23](#)
- [Starting Up the Switch, page 2-24](#)
- [Removing and Installing Components, page 2-25](#)



**Note**

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Before you install, operate, or service the system, read the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family* for important safety information.

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Warning

---

#### IMPORTANT SAFETY INSTRUCTIONS

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.  
Statement 1071

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#### SAVE THESE INSTRUCTIONS

---



Warning

This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.  
Statement 1017



Warning

Only trained and qualified personnel should be allowed to install, replace, or service this equipment.  
Statement 1030



Note

Each new switch requires a license; see the *Cisco MDS 9000 Family NX-OS Licensing Guide* for instructions on installing a license.

---

## Preinstallation

This section includes the following information:

- [Installation Options, page 2-2](#)
- [Installation Guidelines, page 2-3](#)
- [Required Equipment, page 2-4](#)
- [Unpacking and Inspecting the Switch, page 2-4](#)

## Installation Options

The Cisco MDS 9100 Series can be installed using the following methods:

- In an open EIA rack, using:
  - The rack-mount kit shipped with the switch
  - The telco and EIA Shelf Bracket Kit (an optional kit, purchased separately) in addition to the rack-mount kit shipped with the switch
- In a perforated or solid-walled EIA cabinet, using:
  - The rack-mount kit shipped with the switch
  - The telco and EIA Shelf Bracket Kit (an optional kit, purchased separately) in addition to the rack-mount kit shipped with the switch

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- In a two-post telco rack, using:
  - The telco and EIA Shelf Bracket Kit (an optional kit, purchased separately) in addition to the front brackets shipped with the switch

For instructions on installing the switch using the rack-mount kit shipped with the switch, see the [“Installing the Switch in a Cabinet or Rack”](#) section on page 2-5.

For instructions on installing the switch using the optional, separately purchased telco and EIA Shelf Bracket Kit, see the [“Cisco MDS 9000 Family Telco and EIA Shelf Bracket”](#) section on page A-3.



**Note**

The telco and EIA Shelf Bracket Kit is optional and is not provided with the switch. To order the kit, contact your switch provider.

## Installation Guidelines

Follow these guidelines when installing the Cisco MDS 9100 Series:

- Plan your site configuration and prepare the site before installing the switch. The recommended site planning tasks are listed in [Appendix D, “Site Planning and Maintenance Records.”](#)
- Ensure there is adequate space around the switch to allow for servicing the switch and for adequate airflow (airflow requirements are listed in [Appendix B, “Technical Specifications”](#)).
- Ensure the air-conditioning meets the heat dissipation requirements listed in [Appendix B, “Technical Specifications.”](#)
- Ensure the cabinet or rack meets the requirements listed in [Appendix A, “Cabinet and Rack Installation.”](#)



**Note**

If the front cabinet mounting rails are not offset from the front door or bezel panel by a minimum of 3 in. (7.6 cm), and a minimum of 5 in. (12.7 cm) if cable management brackets are installed on the front of the chassis, the chassis should be mounted rear-facing to ensure the minimum bend radius for fiber-optic cables. See the [“Installing the Switch in a Cabinet with Insufficient Front Clearance”](#) section on page 2-11.



**Note**

Jumper power cords are available for use in a cabinet. For more information, see the [“Jumper Power Cord”](#) section on page C-6.

- Ensure the chassis is adequately grounded. If the switch is not mounted in a grounded rack, we recommend connecting both the system ground on the chassis and the power supply ground to an earth ground.
- Ensure the site power meets the power requirements listed in [Appendix B, “Technical Specifications.”](#) If available, you can use an uninterruptible power supply (UPS) to protect against power failures.



**Caution**

Avoid UPS types that use ferroresonant technology. These UPS types can become unstable with systems such as the Cisco MDS 9000 Family, which can have substantial current draw fluctuations because of fluctuating data traffic patterns.

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- Ensure that circuits are sized according to local and national codes.

For North America, the 300-W power supplies require a 20-A circuit. If you are using a 200- or 240-VAC power source in North America, the circuit must be protected by a two-pole circuit breaker.



---

**Caution** To prevent loss of input power, ensure the total maximum loads on the circuits supplying power to the switch are within current ratings for wiring and breakers.

---

- As you install and configure the switch, record the information listed in the [“Site Planning and Maintenance Records”](#) section on page D-1.
- Use the following screw torques when installing the switch:
  - Captive screws: 4 in-lb
  - M3 screws: 4 in-lb
  - M4 screws: 12 in-lb
  - 10-32 screws: 20 in-lb
  - 12-24 screws: 30 in-lb

## Required Equipment

Gather the following tools before beginning the installation:

- Number 1 Phillips screwdriver with torque capability
- 3/16-in. flat-blade screwdriver
- Tape measure and level
- ESD wrist strap or other grounding device
- Antistatic mat or antistatic foam

The following additional items (not found in the accessory kit) are required to ground the chassis:

- Grounding cable (6 AWG recommended), sized according to local and national installation requirements; the required length depends on the proximity of the switch to proper grounding facilities
- Crimping tool large enough to accommodate girth of lug
- Wire-stripping tool

## Unpacking and Inspecting the Switch



**Caution**

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When handling switch components, wear an ESD strap and handle modules by the carrier edges only. An ESD socket is provided on the chassis. For the ESD socket to be effective, the chassis must be grounded through the power cable, the chassis ground, or the metal-to-metal contact with a grounded rack.

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**Tip**

Keep the shipping container in case the chassis requires shipping in the future.

**Note**

If you purchased Cisco support through a Cisco reseller, contact the reseller directly. If you purchased support directly from Cisco, contact Cisco Technical Support at this URL:  
[http://www.cisco.com/en/US/support/tsd\\_cisco\\_worldwide\\_contacts.html](http://www.cisco.com/en/US/support/tsd_cisco_worldwide_contacts.html)

**Note**

The switch is thoroughly inspected before shipment. If any damage occurred during transportation or any items are missing, contact your customer representative immediately.

To inspect the shipment, follow these steps:

- Step 1** Compare the shipment to the equipment list provided by your customer service representative and verify that you have received all items, including the following:
- Print documentation and CD-ROMs
  - Grounding lug kit
  - Rack-mount kit
  - ESD wrist strap
  - Cables and connectors
  - Any optional items ordered
- Step 2** Check for damage and report any discrepancies or damage to your customer service representative. Have the following information ready:
- Invoice number of shipper (see packing slip)
  - Model and serial number of the damaged unit
  - Description of damage
  - Effect of damage on the installation

## Installing the Switch in a Cabinet or Rack

This section describes how to use the rack-mount kit provided with the switch to install the Cisco MDS 9100 Series into a cabinet or rack that meets the requirements described in [Appendix A, “Cabinet and Rack Installation.”](#)

**Caution**

If the rack is on wheels, ensure that the brakes are engaged or that the rack is otherwise stabilized.

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The rack-mount kit provided with the switch contains the items listed in [Table 2-1](#).

**Table 2-1** Cisco MDS 9148, MDS 9134, and Cisco MDS 9124 Fabric Switch Rack-Mount Kit

Description	Quantity
30- to 36-inch slider rails	2 per kit
24- to 30-inch slider rails	2 per kit
18- to 24-inch slider rails	2 per kit
Front rack-mount brackets	2 per kit
12-24 x 3/4-inch Phillips binder-head screws	10 per kit
10-32 x 3/4-inch Phillips binder-head screws	10 per kit
M4 x 6-mm Phillips flat-head screws	6 per kit
12-24 Cage nuts	10 per kit

## Front-Facing Installation

To install the switch in a cabinet or rack using the rack-mount kit provided with the switch, follow these steps:

- 
- Step 1** Install the front rack-mount bracket as follows:
- a. Position one of the front rack-mount brackets against the side of the switch and align the screw holes as shown in [Figure 2-1](#). Then attach the bracket to the switch with the three M4 screws originally provided with the bracket.
  - b. Repeat with the other front rack-mount bracket on the other side of the switch.

- Step 2** Install the C brackets as follows:




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**Note** Two C brackets are shipped preinstalled on the switch, using three M3 screws per bracket. This installation step is only necessary if the C brackets were removed.

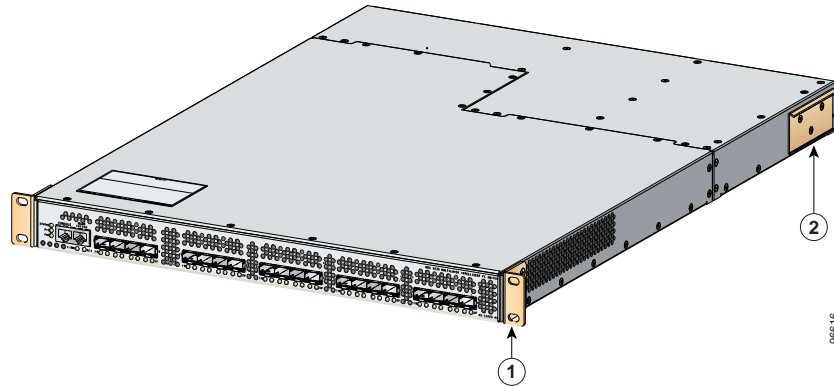
---

- a. Position one of the C brackets against the side of the switch and align the screw holes as shown in [Figure 2-1](#). Then attach the bracket to the switch with the three M3 screws originally provided with the bracket.
- b. Repeat with the other C bracket on the other side of the switch.



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**Figure 2-1** Front Rack-Mount Brackets and C Brackets Installed on the Cisco MDS 9100 Series



1	Front rack-mount bracket	2	C bracket
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- Step 3** Install the slider rails in the rack. Position one of the slider rails against the rack mounting rails and align the screw holes as shown in [Figure 2-2](#). If you are using the notched slider rails for the Cisco MDS 9134 or the Cisco MDS 9124 Switch, see [Figure 2-3](#).



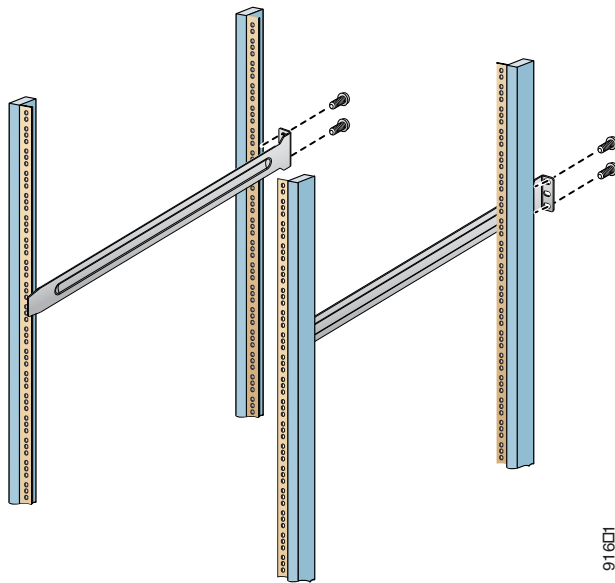
**Note** Depending on when you purchased your Cisco MDS 9124 Switch, you may have straight slider rails like those shown in [Figure 2-2](#), or you may have the notched slider rails like those shown in [Figure 2-3](#). Refer to the illustrations that show the type of rails that came with your switch.

- Step 4** Attach the slider rail using two 12-24 screws or two 10-32 screws, depending on the rack rail thread type. For racks with square holes, insert the 12-24 cage nuts in position behind the mounting holes in the slider rails.
- a. Repeat with the other slider rail on the other side of the rack.

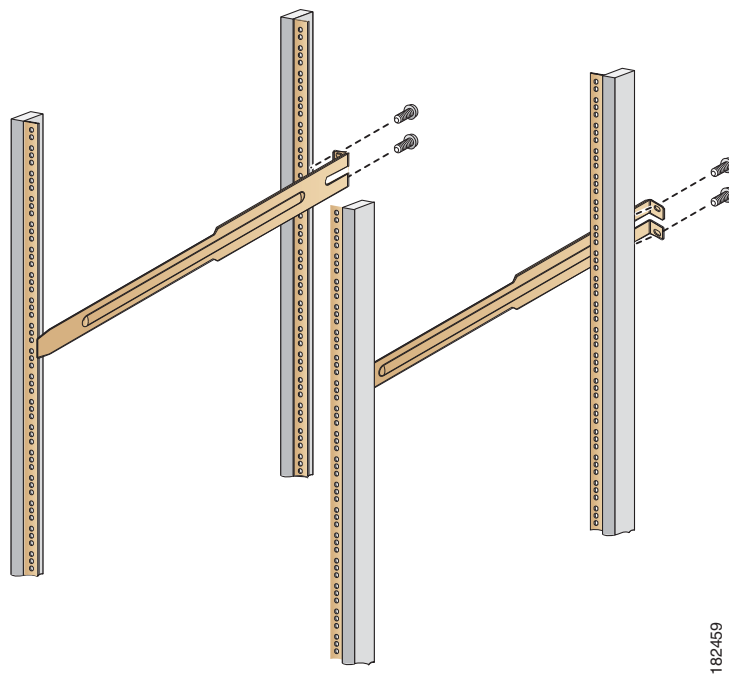
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- b. Use the tape measure and level to verify that the rails are horizontal and at the same height.

**Figure 2-2** *Installing the Slider Rails*



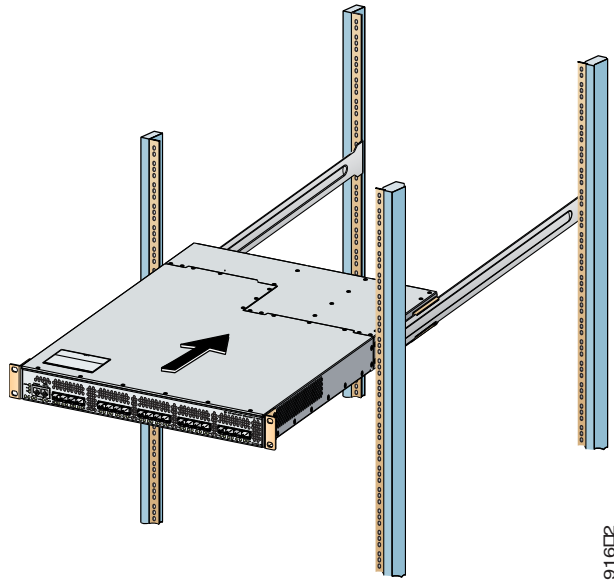
**Figure 2-3** *Installing the Notched Slider Rails*



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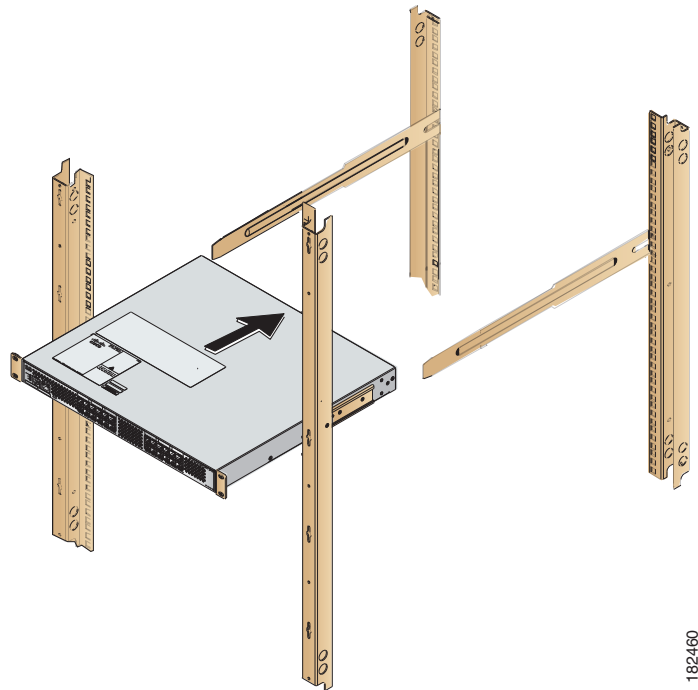
- Step 5** Insert the switch into the rack:
- By using both hands, position the switch with the back of the switch between the front rack-mounting rails as shown in [Figure 2-4](#). If you are using the notched rails, for the Cisco MDS 9148 Switch, Cisco MDS 9134 Switch, or the Cisco MDS 9124 Switch, see [Figure 2-5](#).
  - Align the two C brackets on either side of the switch with the slider rails installed in the rack. Slide the C brackets onto the slider rails, and then gently slide the switch all the way into the rack. If the switch does not slide easily, try realigning the C brackets on the slider rails.

**Figure 2-4** Sliding the Cisco MDS 9100 Series onto the Slider Rails



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**Figure 2-5** Sliding the Cisco MDS 9148, Cisco MDS 9134 Switch, or the Cisco MDS 9124 Switch onto the Notched Slider Rails

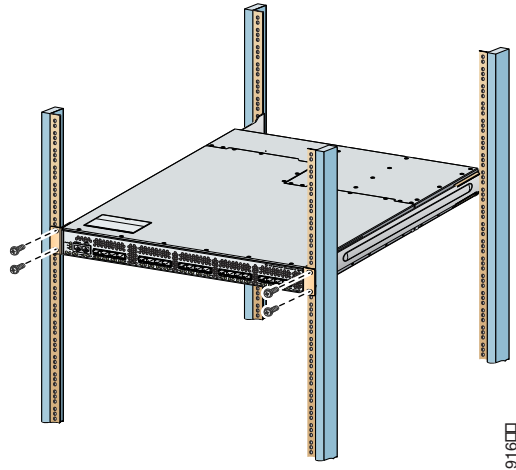


- Step 6** Stabilize the switch in the rack by attaching the front rack-mount brackets to the front rack-mounting rails:
- a. Insert two screws (12-24 or 10-32, depending on rack type) and through the cage nuts and the holes in one of the front rack-mount brackets and into the threaded holes in the rack-mounting rail (see [Figure 2-6](#) or [Figure 2-7](#)).
  - b. Repeat for the front rack-mount bracket on the other side of the switch.

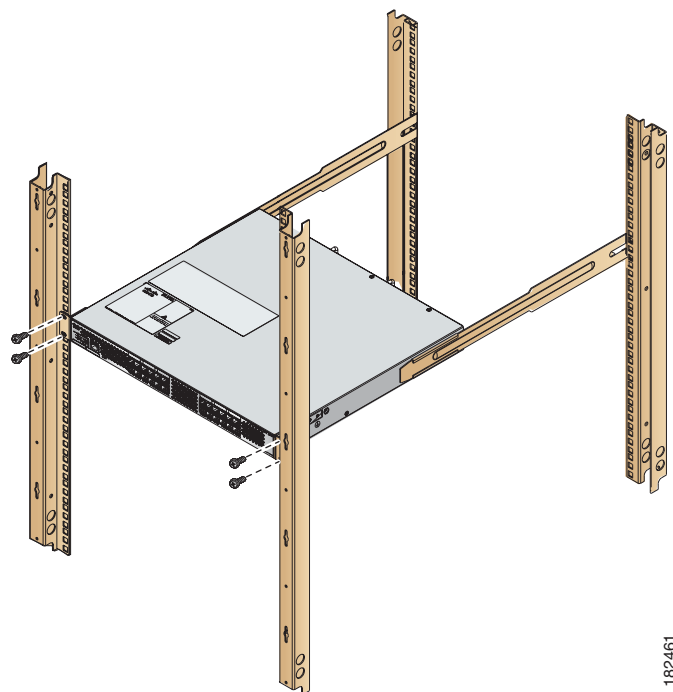
If you are installing the optional cable guides, place the cable guides in front of the front rack-mount brackets, and then pass the screws through the cable guides, front rack-mount brackets, and mounting rail. You can install one or both cable guides; if installing a single cable guide, it can be installed on either side.

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**Figure 2-6 Attaching the Switch to the Rack**



**Figure 2-7 Attaching the Cisco MDS 9148, Cisco MDS 9134 Switch, or the Cisco MDS 9124 Switch to the Rack (Notched Rails)**



## Installing the Switch in a Cabinet with Insufficient Front Clearance

This section describes how to use the rack-mount kit provided with the switch to install the Cisco MDS 9100 Series switch into a cabinet with insufficient front-facing clearance. The Cisco MDS 9100 Series switch is installed rear-facing to provide adequate clearance for the fibre-optic cables. This cabinet meets

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the requirements described in [Appendix A, “Cabinet and Rack Requirements,”](#) except the cabinet has less than three-inch clearance between the inside of the front door or bezel panel and the front cabinet mounting rails. This rear-facing installation is necessary to ensure that the minimum bend radius for the fiber-optic cables is maintained. In these cabinets, the Cisco MDS 9100 Series switch is mounted backwards, with the fiber-optic cables facing toward the rear of the cabinet and the power supplies facing the front of the cabinet.

**Caution**

---

If the rack is on wheels, ensure that the brakes are engaged or that the rack is otherwise stabilized.

---

The rack-mount kit provided with the switch contains the items listed in [Table 2-1](#).

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## Installing Front Rack-Mount Brackets for Cabinets with 26 Inches or Greater of Rail Spacings

The front rack-mount brackets for the Cisco MDS 9100 Series switch must be installed onto the switch prior to installing the switch into the cabinet. Follow these steps for cabinets with front-mounting rail to rear-mounting rail spacings greater or equal to 26 inches.

- Step 1** Install the front rack-mount brackets as follows:
- Position one of the front rack-mount brackets against the side of the switch and align the screw holes as shown in [Figure 2-8](#). Then attach the bracket to the switch with the three M4 screws originally provided with the bracket.
  - Repeat with the other front-rack mount bracket on the other side of the switch.

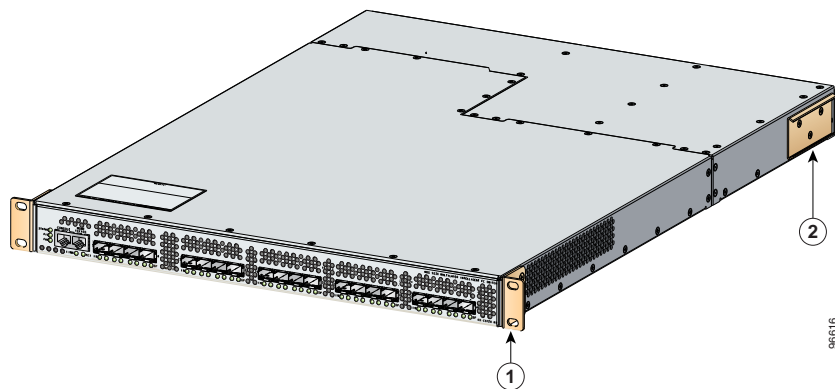
- Step 2** Install the C brackets as follows:



**Note** Two C brackets are shipped preinstalled on the switch, using three M3 screws per bracket. This installation step is only necessary if the C brackets were removed.

- Position one of the C brackets against the side of the switch and align the screw holes as shown in [Figure 2-8](#). Then attach the bracket to the switch with the three M3 screws originally provided with the bracket.
- Repeat with the other C bracket on the other side of the switch.

**Figure 2-8** Front Rack-Mount Brackets and C Brackets Installed on the Cisco MDS 9100 Series



1	Front rack-mount bracket	2	C bracket
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## Installing Front Rack-Mount Brackets for Cabinets with Less Than 26 Inches of Rail Spacings

The front rack-mount brackets for the Cisco MDS 9100 Series switches must be installed onto the switch prior to installing the switch into the cabinet. To install brackets for cabinets with front-mounting rail to rear-mounting rail spacings less than 26 inches that need to be mounted backwards to maintain adequate fiber-optic clearances, follow these steps:

- Step 1** Install the front-rack mount brackets for cabinets with rail-to-rail spacings less than 26 inches as follows:
- Position one of the front rack-mount brackets against the side of the switch and align the screw holes as shown in [Figure 2-9](#). Then attach the bracket to the switch with two of the three M4 screws originally provided with the bracket.
  - Repeat with the other front rack-mount bracket on the other side of the switch.



**Note**

The front rack-mount bracket does not align with all three holes in the Cisco MDS 9100 Series switch in this configuration. The two screws are adequate to hold the weight of the Cisco MDS 9100 Series switch.

- Step 2** Install the C brackets as follows:

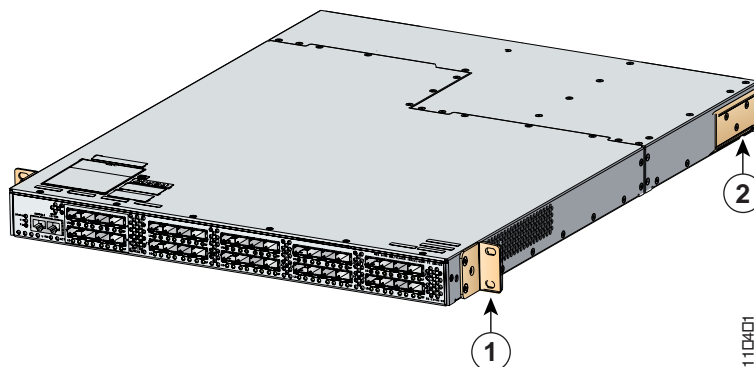


**Note**

Two C brackets are shipped preinstalled on the switch, using three M3 screws per bracket. This installation step is only necessary if the C brackets were removed.

- Position one of the C brackets against the side of the switch and align the screw holes as shown in [Figure 2-9](#). Then attach the bracket to the switch with the three M3 screws originally provided with the bracket.
- Repeat with the other C bracket on the other side of the switch.

**Figure 2-9** *Front Rack-Mount Brackets (Rotated) and C Brackets Installed on the Cisco MDS 9100 Series*



1	Front rack-mount bracket	2	C bracket
---	--------------------------	---	-----------



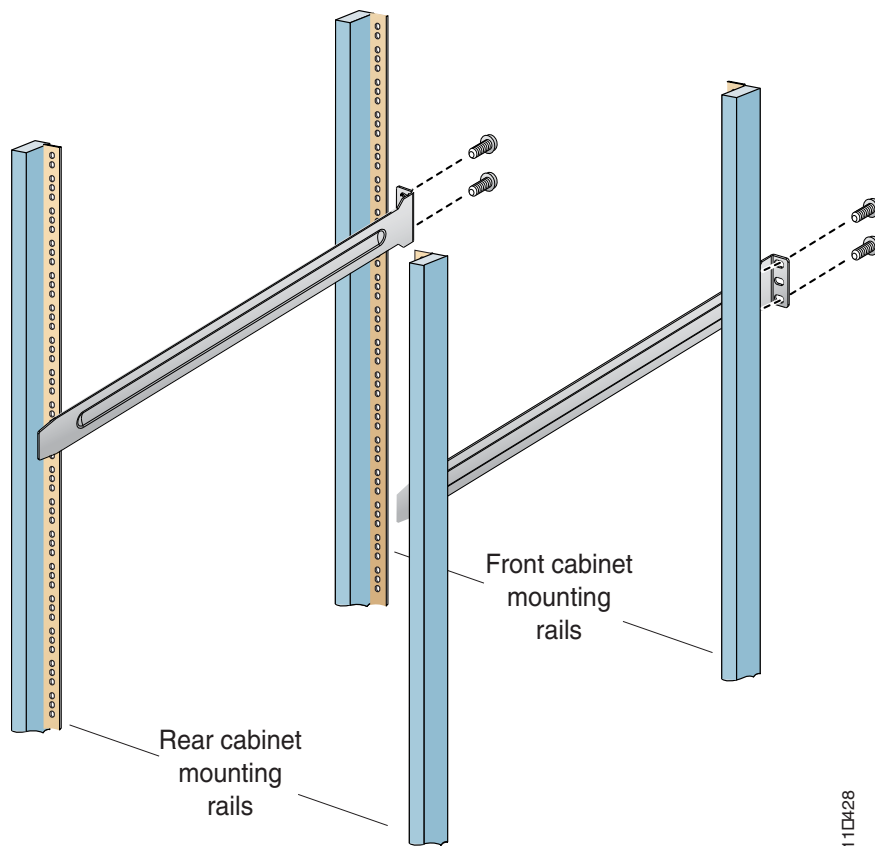
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## Installing Cisco MDS 9100 Series Switch Rear-Facing into Cabinet

To install a Cisco MDS 9120 or 9140 Switch rear-facing into a cabinet using the rack-mount kit provided with the switch (for cabinets with insufficient front-facing clearance), follow the steps in this section. If you are installing a Cisco MDS 9134 Switch, Cisco MDS 9134 Switch, or a Cisco MDS 9124 Switch rear-facing into a cabinet using the rack-mount kit provided, see [“Installing a Cisco MDS 9148 Switch, Cisco MDS 9134 Switch, or a Cisco MDS 9124 Switch Rear-Facing into Cabinet”](#) section on page 2-17.

- Step 1** Install the slider rails in the rack:
- Position one of the slider rails against the front rack-mounting rails and align the screw holes as shown in [Figure 2-10](#). Then attach them using two 12-24 screws or two 10-32 screws, depending on the rack rail thread type. For racks with square holes, first install the 12-24 cage nuts.
  - Repeat with the other slider rail on the other front side of the rack.
  - Use the tape measure and level to verify that the rails are horizontal and at the same height.

**Figure 2-10** *Installing the Slider Rails to the Front Rack-Mounting Rails*



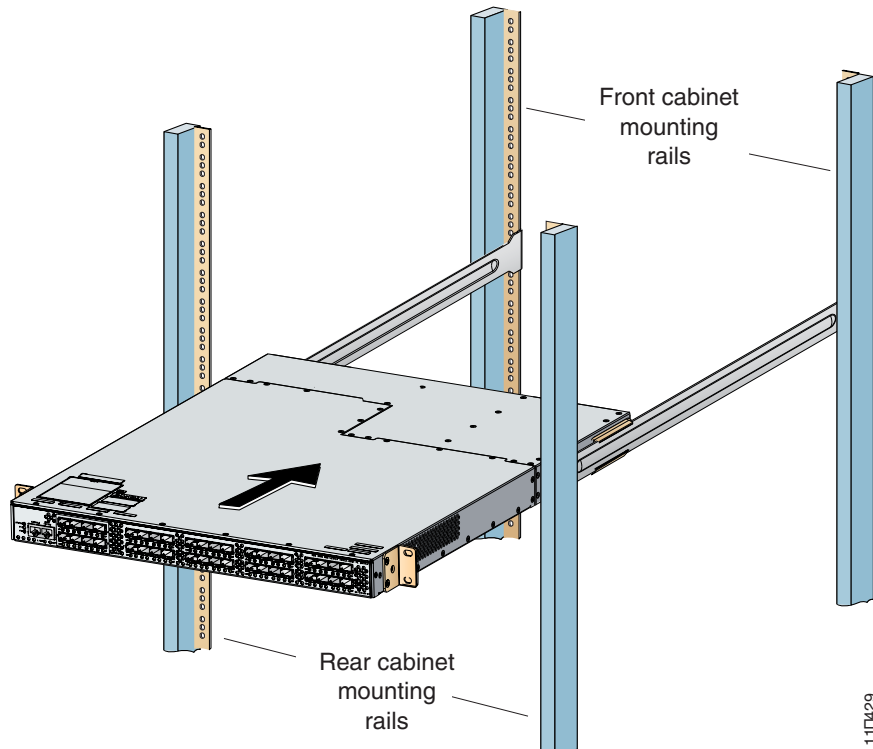
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- Step 2** Insert the switch into the rack:
- By using both hands, position the switch with the back of the switch between the rear rack-mounting rails as shown in [Figure 2-11](#).



**Note** [Figure 2-11](#) shows the front rack-mount brackets in a 180 degree position. Your front rack-mount brackets may look different if you kept them in the normal position.

**Figure 2-11** *Sliding the Cisco MDS 9100 Series Switch (Rear-Facing) onto the Slider Rails*



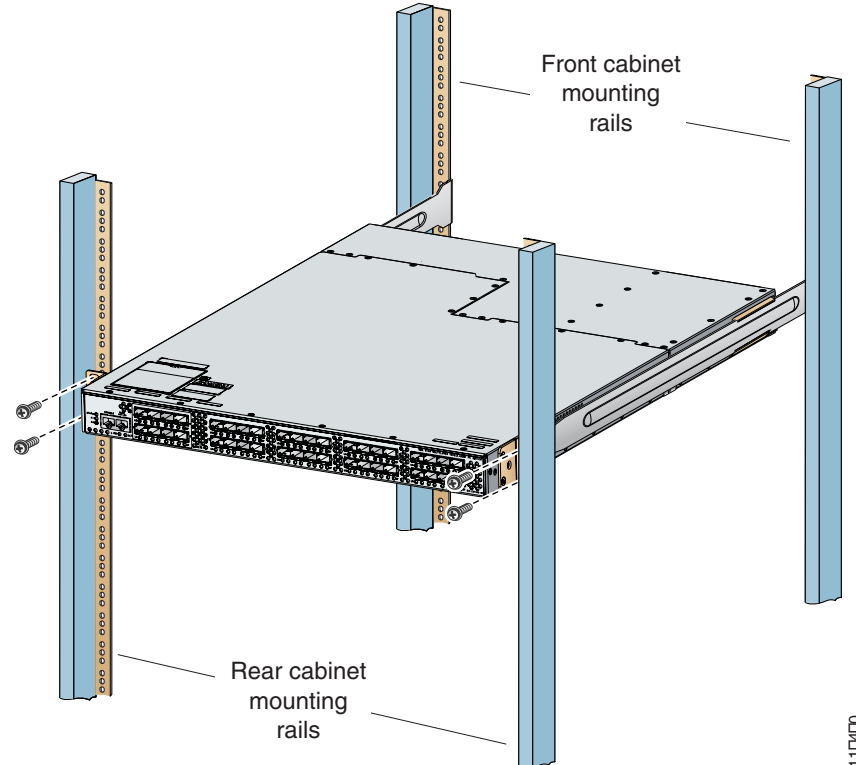
- Align the two C brackets on either side of the switch with the slider rails installed in the rack. Slide the C brackets onto the slider rails and then gently slide the switch all the way into the rack. If the switch does not slide easily, try realigning the C brackets on the slider rails.
- Step 3** Stabilize the switch in the rack by attaching the front rack-mount brackets to the rear rack-mounting rails:
- Insert two screws (12-24 or 10-32, depending on rack type) through the holes in one of the front rack-mount brackets and into the threaded holes in the back rack-mounting rail (see [Figure 2-12](#).) For racks with square holes, first install the 12-24 cage nuts.



**Note** [Figure 2-12](#) shows the front rack-mount brackets in 180 degree position. Your front rack-mount brackets may look different if you kept them in the normal position.

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**Figure 2-12 Attaching the Cisco MDS 9100 Series Switch (Rear-Facing) to the Cabinet**



- b. Repeat for the front rack-mount bracket on the other side of the switch.

If you are installing the optional cable guides, place the cable guides in front of the front rack-mount brackets, and then pass the screws through the cable guides, front rack-mount brackets, and rear mounting rail. You can install one or both cable guides; if installing a single cable guide, it can be installed on either side.

## Installing a Cisco MDS 9148 Switch, Cisco MDS 9134 Switch, or a Cisco MDS 9124 Switch Rear-Facing into Cabinet

To install a Cisco MDS 9134 Switch, Cisco MDS 9134 Switch, or a Cisco MDS 9124 Switch rear-facing into a cabinet using the rack-mount kit provided with the switch (for cabinets with insufficient front-facing clearance), follow these steps:

- Step 1** Install the notched slider rails in the rack:

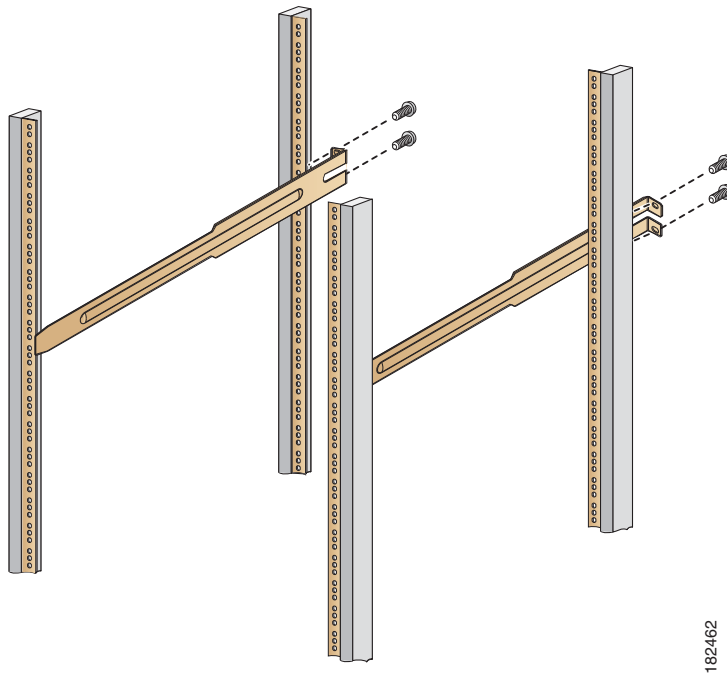
*Send documentation comments to [mdsfeedback-doc@cisco.com](mailto:mdsfeedback-doc@cisco.com)*



**Note** When installing the Cisco MDS 9148 Switch, Cisco MDS 9134 Switch or the Cisco MDS 9124 Switch rear-facing into a cabinet, do not install it higher than RU-30.

- a. Route the power cord through the open cutout at the end of one of the slider rails, and then let the cord dangle while you proceed with the next steps. [Figure 2-15](#) shows a power cord correctly routed through the open cutout in the slider rail.
- b. Position one of the slider rails against the front rack-mounting rails and align the screw holes as shown in [Figure 2-13](#). Then attach them using two 12-24 screws or two 10-32 screws, depending on the rack rail thread type. For racks with square holes, first install the 12-24 cage nuts.
- c. Repeat with the other slider rail on the other front side of the rack.
- d. Use the tape measure and level to verify that the rails are horizontal and at the same height.

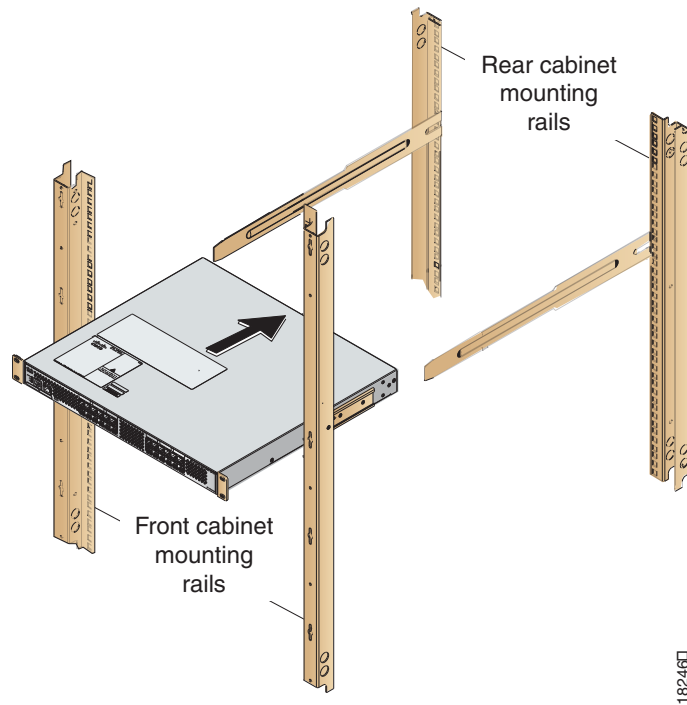
**Figure 2-13** *Installing the Notched Slider Rails to the Front Rack-Mounting Rails*



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- Step 2** Insert the switch into the rack:
- Using both hands, position the switch with the back of the switch between the rear rack-mounting rails as shown in [Figure 2-14](#).

**Figure 2-14** *Sliding a Cisco MDS 9134, Cisco MDS 9134 Switch, or the Cisco MDS 9124 Switch (Rear-Facing) on the Notched Slider Rails*



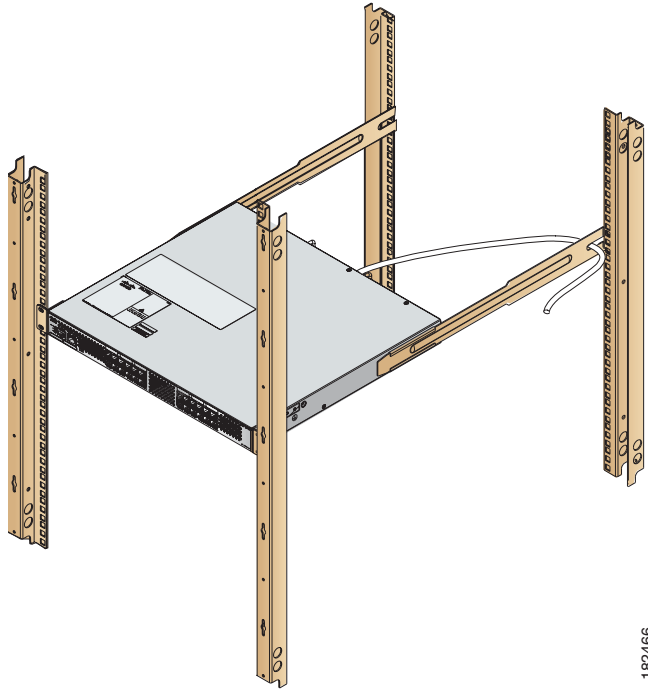
- Align the two C brackets on either side of the switch with the slider rails installed in the rack. Slide the C brackets onto the slider rails and then gently slide the switch all the way into the rack. If the switch does not slide easily, try realigning the C brackets on the slider rails.
- Step 3** Connect the power cord that you previously routed through the open cutout of the slider rail to the switch, as shown in [Figure 2-15](#). Limit the length of the power cord between the back of the chassis and the rail opening.



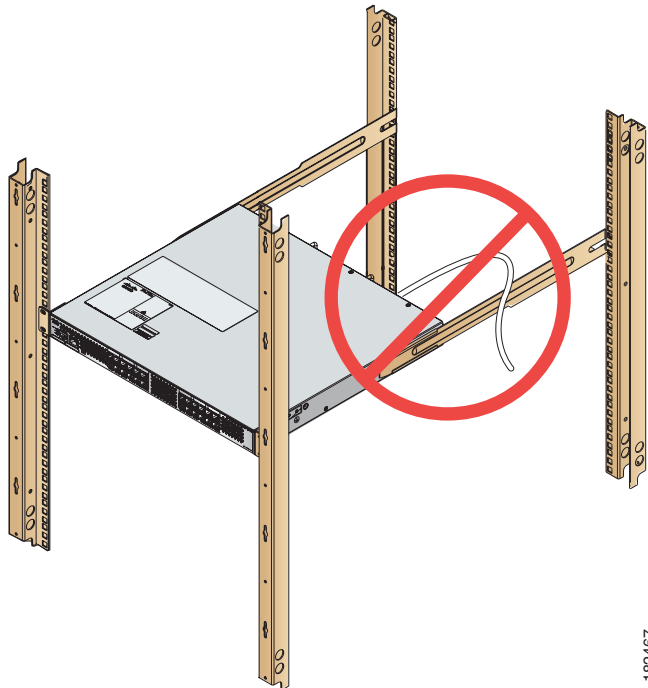
**Note** If you failed to route the power cord through the open cutout of the slider rail as directed in Step 1, remove the switch and rails and remount the rails using the correct method. Do not connect the power cord by routing it over the top of the slider rail, as shown in [Figure 2-16](#). This type of installation is hazardous.

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**Figure 2-15** Correct Position of Power Cord Routed Through Notched Slider Rail



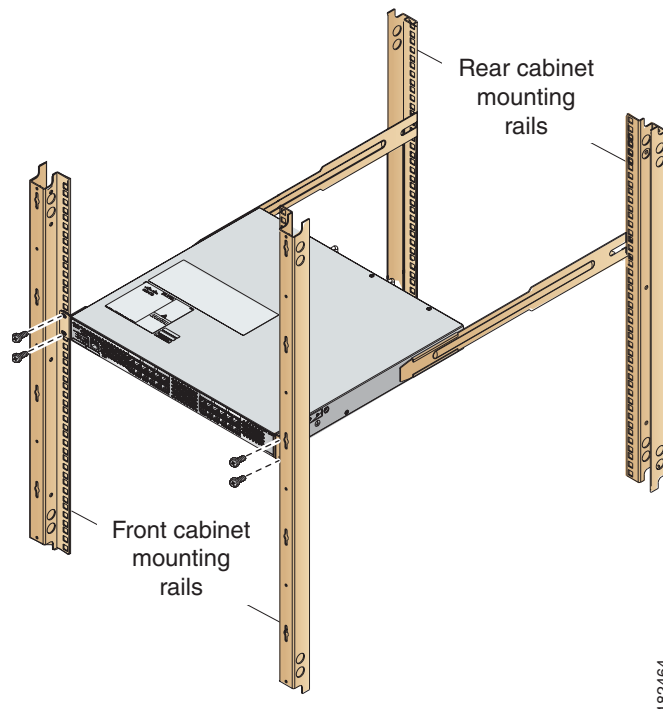
**Figure 2-16** Incorrect Position of Power Cord Routed Over the Notched Slider Rail



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- Step 4** Stabilize the switch in the rack by attaching the front rack-mount brackets to the rear rack-mounting rails:
- Insert two screws (12-24 or 10-32, depending on rack type) through the holes in one of the front rack-mount brackets and into the threaded holes in the back rack-mounting rail (see [Figure 2-17](#)). For racks with square holes, first install the 12-24 cage nuts.

**Figure 2-17** Attaching the Cisco MDS 9148, Cisco MDS 9134 Switch, or the Cisco MDS 9124 Switch (Rear-Facing) to the Cabinet



- Repeat for the front rack-mount bracket on the other side of the switch.



**Tip**

If the chassis exceeds the 1-RU space on the low side of the rack, you may have difficulty installing other equipment. In this situation, loosen the screws on the front and back rails of the chassis and raise it to the top of the RU space by pushing the chassis up until it cannot go any further. Then retighten the screws while keeping the chassis in the elevated position.

## Installing Cisco MDS 9134 48-Port and 64-Port Bundles

To install multiple Cisco MDS 9134 Switches to expand up to 48 ports and up to 64 ports, follow these steps:

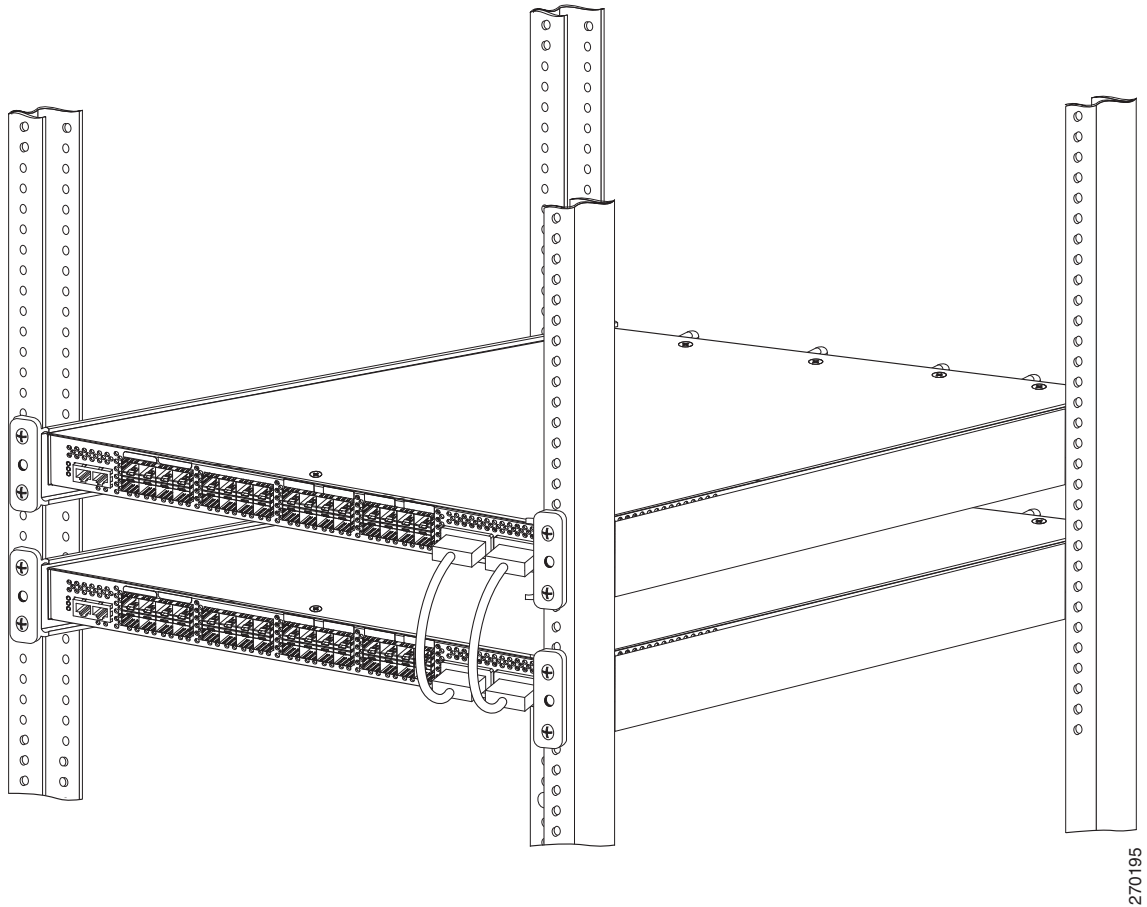
- Step 1** Ensure that the boxes that are received each consist of a Cisco MDS 9134 Switch with a 10-Gbps transceiver plugged in and a copper cable.
- Step 2** Install the MDS 9134 Switches by placing one on top of the other (recommended) or side-by-side.

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In both types of above-mentioned switch configurations, the distance between the 10-Gbps ports of the switches can be a maximum of 1 meter. Currently, only 1-meter cables are shipped with the boxes.

- Step 3** Ensure that a copper X2 CX4 transceiver is plugged into the 10-Gbps port of each switch.
- Step 4** Plug in one end of the copper cable in the same box that is supplied to the 10-Gbps transceiver of the MDS 9134 Switch. Plug in the other end to the 10-Gbps transceiver of the MDS 9134 Switch from the second box in order to connect the two MDS 9134 Switches.

**Figure 2-18** Installing the MDS 9134 48-port and 64-port Bundles



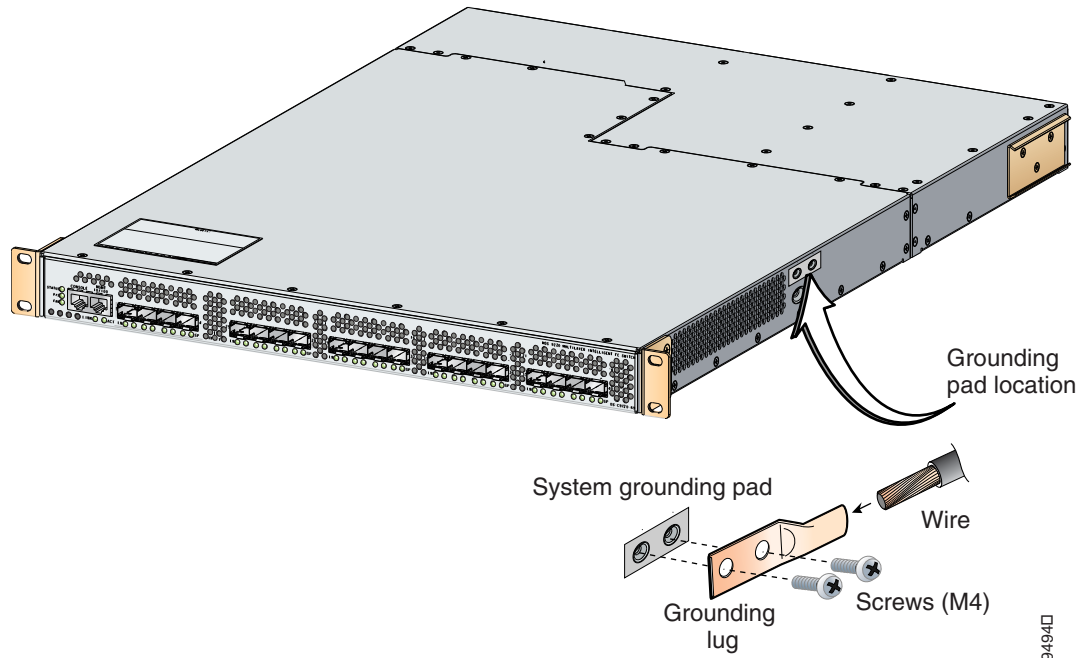


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## Grounding the Switch

A grounding pad with two threaded M4 holes is provided on the chassis for attaching a grounding lug. [Figure 2-19](#) shows the system ground location on the Cisco MDS 9100 Series.

**Figure 2-19** Location of Switch Ground on the Cisco MDS 9100 Series



**Warning**

When installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046

**Caution**

We recommend grounding the chassis, even if the rack is already grounded.

**Note**

If the rack is less than 25-in. (635 mm) deep, the slider rails will cover the grounding hole. Therefore, the rack must either be grounded or at least 25-in. (635 mm) deep.

**Caution**

All power supplies must be grounded. The receptacles of the AC power cables used to provide power to the chassis must be the grounding type, and the grounding conductors should connect to protective earth ground at the service equipment.

**Note**

The grounding lug must be NRTL listed and compatible with copper conductors. Only copper conductors (wires) must be used and the copper conductor must comply with National Electrical Code (NEC) for ampacity.

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**Note**

Customers who require compliance to GR-1089-CORE bonding and grounding requirements, must use the ground conductor.

To attach the grounding lug and cable to the chassis, follow these steps:

- Step 1** Use a wire-stripping tool to remove approximately 0.75 in. (19 mm) of the covering from the end of the grounding cable.
- Step 2** Insert the stripped end of grounding cable into the open end of the grounding lug.
- Step 3** Use the crimping tool to secure the grounding cable in the grounding lug.
- Step 4** Remove the adhesive label from the grounding pad on the chassis.
- Step 5** Place the grounding lug against the grounding pad so that there is solid metal-to-metal contact, and insert the two M4 screws with washers through the holes in the grounding lug and into the grounding pad.
- Step 6** Ensure that the lug and cable do not interfere with other equipment.
- Step 7** Prepare the other end of the grounding cable and connect it to an appropriate grounding point in your site to ensure adequate earth ground.

## Starting Up the Switch

This section provides instructions for powering up the switch and verifying component installation.

**Caution**

During this procedure, wear grounding wrist straps to avoid ESD damage to the switch.

**Note**

Do not connect the MGMT 10/100 Ethernet port to the LAN until the initial switch configuration has been performed. For instructions on connecting to this port, see the [“Connecting the Console Port” section on page 3-1](#).

To power up the switch and verify hardware operation, follow these steps:

- Step 1** Verify that both power supplies and fan modules are installed and tighten any loose captive screws.
- Step 2** Verify that the power switches on both power supplies are off. Then plug the power cables into the power supplies and arrange the cables so that they cannot be accidentally pulled out.

**Note**

Depending on the outlet receptacle on your power distribution unit, you may need the optional jumper power cord to connect the Cisco MDS 9100 Series switch to your outlet receptacle. See the [“Jumper Power Cord” section on page C-6](#).

- Step 3** Connect the other end of the power cables to an AC power source.
- Step 4** Ensure that the switch is adequately grounded as described in the [“Installing the Switch in a Cabinet with Insufficient Front Clearance” section on page 2-11](#), and that the power cables are connected to outlets that have the required AC power voltages (provided in the [“Power Specifications” section on page B-3](#)).

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**Step 5** Flip the power switches on the power supplies to the on (I) position. The switch boots automatically.

**Step 6** Listen for the fans; they should begin operating as soon as the switch is powered on.



---

**Caution** Do not operate the switch without a functioning fan module except for during the brief fan module replacement procedure. The Cisco MDS 9000 Family switches can operate for only a few minutes without any functioning fan modules before they begin to overheat.

---

**Step 7** Verify that the LED behavior is as follows when the switch has finished booting:

- Fan status LED is green.
- Each power supply LED is green.
- The Switch status LED is green. If this LED is orange or red, then one or more environmental monitors is reporting a problem.
- The Ethernet port Link LEDs should not be on unless the cable is connected.



---

**Note** The LEDs for the Fibre Channel ports remain orange until the ports are enabled, and the LED for the MGMT 10/100 Ethernet port remains off until the port is connected.

---

If any LEDs other than the Fibre Channel port LEDs are orange or red after the initial boot processes are complete, see the *Cisco MDS 9000 Family Troubleshooting Guide*.

**Step 8** Try removing and reinstalling a component that is not operating properly. If it still does not operate correctly, contact your customer service representative for a replacement.



---

**Note** If you purchased Cisco support through a Cisco reseller, contact the reseller directly. If you purchased support directly from Cisco, contact Cisco Technical Support at this URL: [http://www.cisco.com/en/US/support/tsd\\_cisco\\_worldwide\\_contacts.html](http://www.cisco.com/en/US/support/tsd_cisco_worldwide_contacts.html)

---

**Step 9** Verify that the system software has booted and the switch has initialized without error messages. If any problems occur, see the *Cisco MDS 9000 Family Troubleshooting Guide* or the *Cisco MDS 9000 Family System Messages Guide*. If you cannot resolve an issue, contact your customer service representative.

**Step 10** Complete the worksheets provided in [Appendix D, “Site Planning and Maintenance Records”](#) for future reference.



---

**Note** A setup utility automatically launches the first time you access the switch and guides you through the basic configuration. For instructions about how to configure the switch and check module connectivity, see the *Cisco Fabric Manager Fundamentals Configuration Guide*.

---

## Removing and Installing Components

The Cisco MDS 9140 Switch and the Cisco MDS 9120 Switch is shipped with two field-replaceable power supplies. Each power supply includes a fixed fan. The Cisco MDS 9140 Switch and the Cisco MDS 9120 Switch also have two field-replaceable fan modules. The Cisco MDS 9148 Switch and

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Cisco MDS 9134 Switch has two hot-swappable power supplies and two hot-swappable fan modules. The Cisco MDS 9124 Switch is shipped with one field-replaceable power supply and three fixed fans. The Cisco MDS 9134 switch and the Cisco MDS 9124 switch support the new DC power supply.

This section provides the following information:

- [Removing and Installing AC Power Supplies, page 2-29](#)
- [Removing and Installing DC Power Supplies, page 2-30](#)
- [Removing and Installing Fan Modules, page 2-32](#)



**Warning**

**Hazardous voltage or energy is present on the backplane when the system is operating. Use caution when servicing.** Statement 1034



**Caution**

During this procedure, wear grounding wrist straps to avoid ESD damage to the switch.



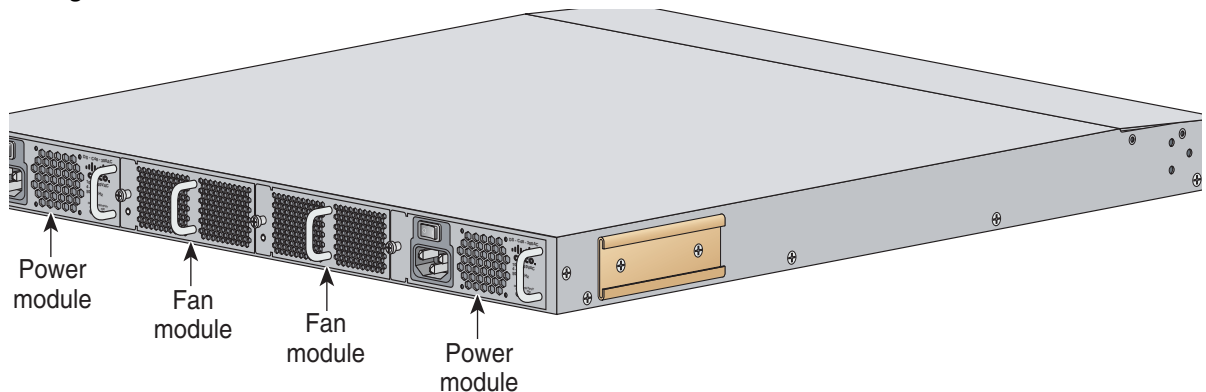
**Note**

Except for the Cisco MDS 9124 switch, all the the other Cisco MDS 9100 Series switches are supported for operation with both power supplies and both fan modules installed, and with all fans working.

With two power supplies installed, if one power supply fails, the system can continue to function normally on a single healthy power supply. However, the failed power supply should be replaced as soon as possible to provide redundancy.

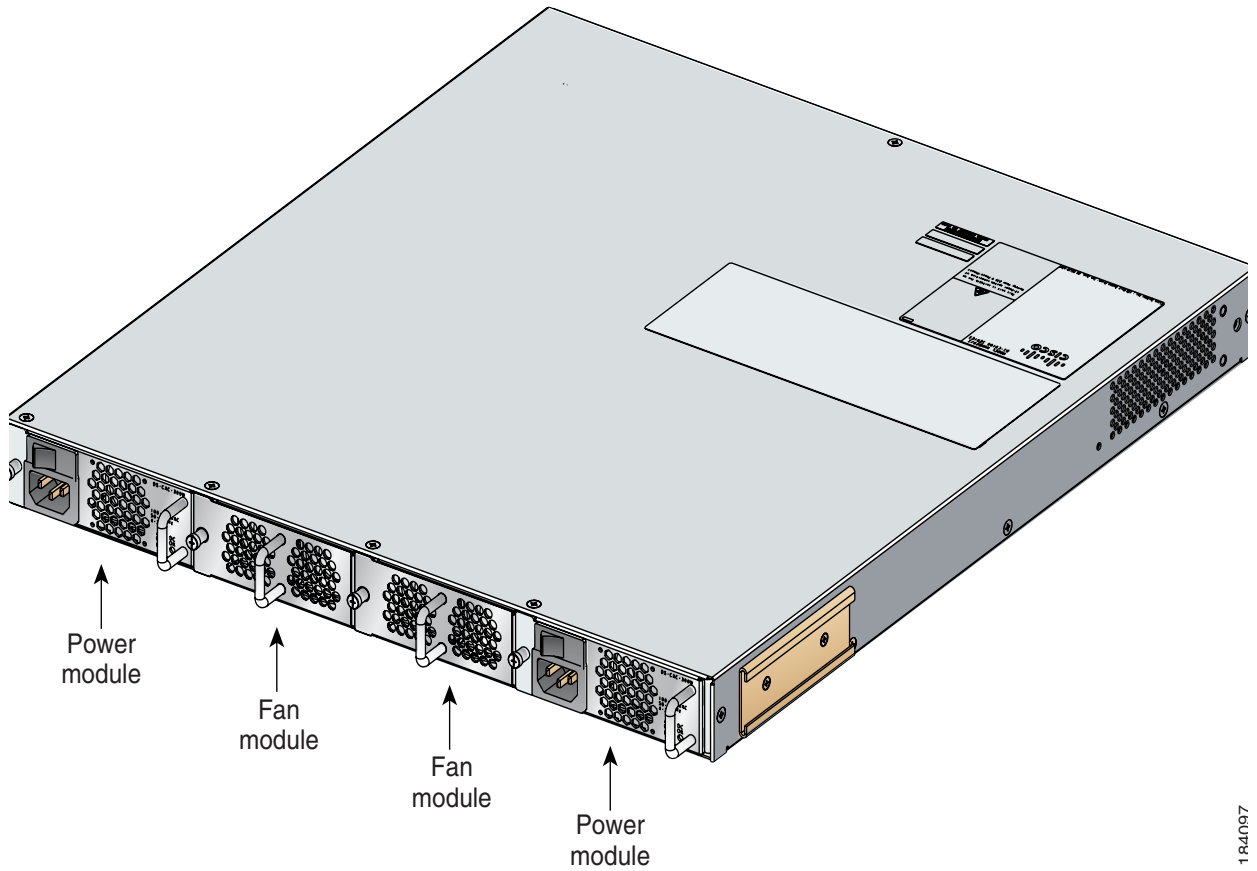
The fan modules are required to ensure proper cooling of the switches. See [Figure 2-20](#), [Figure 2-21](#), [Figure 2-22](#), and [Figure 2-23](#).

**Figure 2-20 Rear View of the Cisco MDS 9148 Switch**



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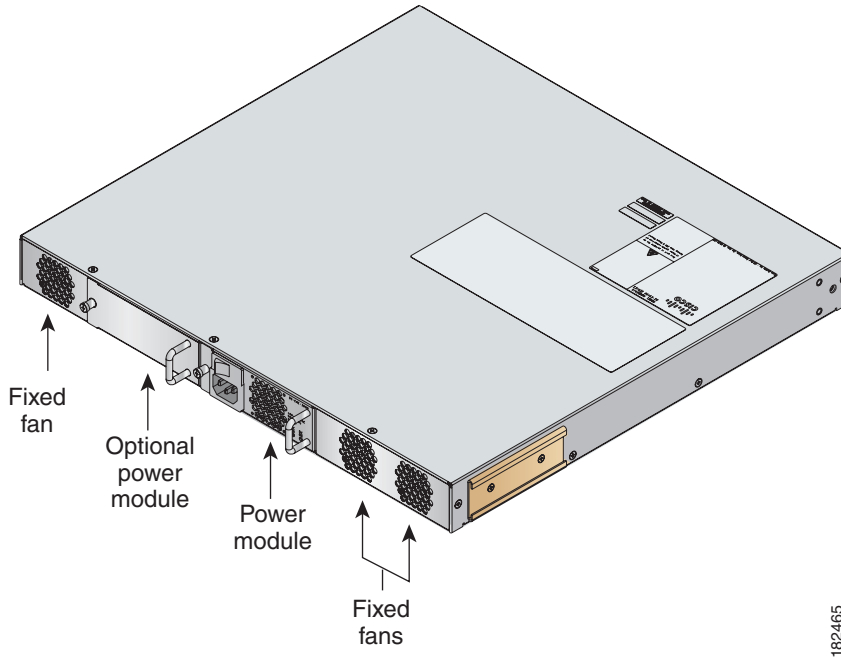
Figure 2-21 Rear View of the Cisco MDS 9134 Switch



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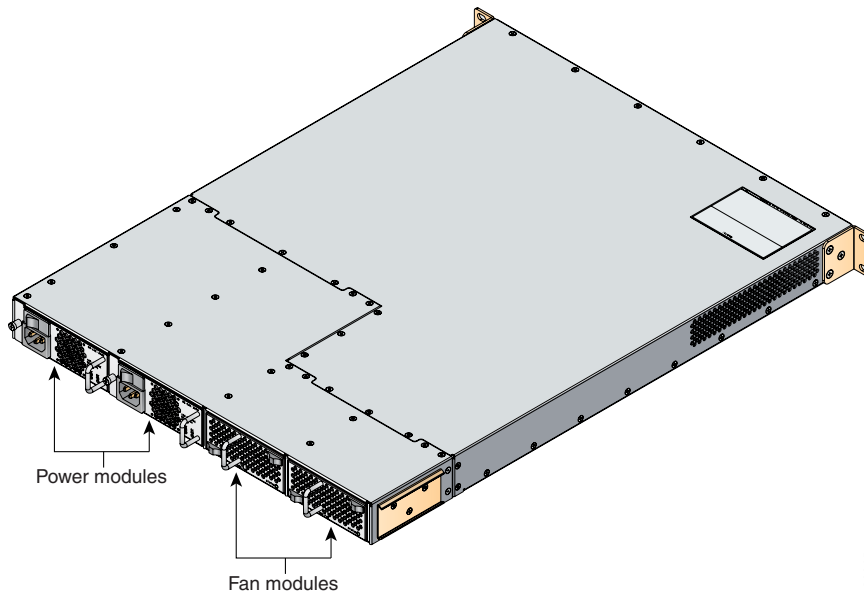
*Send documentation comments to [mdsfeedback-doc@cisco.com](mailto:mdsfeedback-doc@cisco.com)*

**Figure 2-22** Rear View of the Cisco MDS 9124 Switch



For the Cisco MDS 9140 Switch and the Cisco MDS 9120 Switch, the fans should not be removed for prolonged periods of time during operation. If one fan module fails, a single healthy fan module can temporarily provide sufficient cooling to maintain switch operation under normal conditions, but the failed fan module should be replaced as soon as possible. See [Figure 2-23](#).

**Figure 2-23** Rear View of the Cisco MDS 9140 Switch and the Cisco MDS 9120 Switch



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## Removing and Installing AC Power Supplies

This section provides instructions for removing and installing the AC power supplies for the Cisco MDS 9100 Series switches.



### Caution

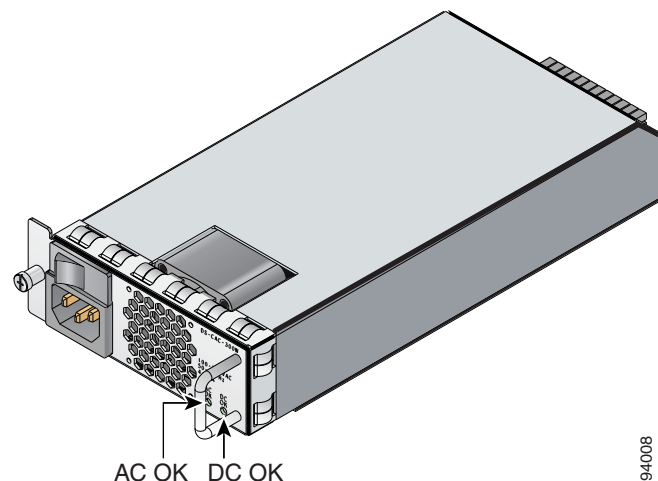
Power supplies for the Cisco 9100 Series switches look similar but they differ slightly. Be sure to use the correct power supply designated for your Cisco 9100 Series switch. Using an incorrect power supply will not provide redundant power in the case of a power supply failure.

## Removing Power Supplies

To remove a AC power supply, follow these steps:

- Step 1** Turn the power switch to the off (0) position on the power supply that you are removing.
- Step 2** Disconnect the power cord from the power source.
- Step 3** Loosen the captive screw.
- Step 4** Grasp the power supply handle and slide the power supply out of the switch. See [Figure 2-24](#).

**Figure 2-24** Cisco MDS 9100 Series AC Power Supply



## Installing Power Supplies

To install the dual 300-W AC-input power supplies, follow these steps:

- Step 1** Ensure that the system (earth) ground connection has been made.

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- Step 2** Make sure the power cord is disconnected before installing the power supply.
- Step 3** Verify that the power switch is in the off (O) position on the power supply that you are installing.
- Step 4** Slide the power supply into the power supply bay. Make sure that the power supply is fully seated in the bay.
- Step 5** Tighten the power supply captive screw.
- Step 6** Plug the power cord into the power supply.
- Step 7** Connect the other end of the power cord to an AC-input power source.




---

**Note** Depending on the outlet receptacle on your power distribution unit, you may need the optional jumper power cord to connect the Cisco MDS 9100 Series switch to your outlet receptacle. See the [“Jumper Power Cord” section on page C-6](#).

---

- Step 8** Turn the power switch to the on (I) position on the power supply.
  - Step 9** Verify power supply operation by checking that the power supply (P/S) LED in the front panel is green. If the LED is not green, see the *Cisco MDS 9000 Family Troubleshooting Guide*.
- 

## Removing and Installing DC Power Supplies

This section provides instructions for removing and installing the DC power supplies for the Cisco MDS 9100 Series switch.




---

**Note** The new DC power supply is not supported on the Cisco MDS 9140 Switch, Cisco MDS 9148 Switch, and the Cisco MDS 9120 Switch.

---

The DC power supply does NOT use country-specific power cords like its AC power supply counterpart. A DC power supply is provided with terminal blocks where it is expected that the customer will provide the wiring to the terminal blocks (See [Figure 2-25](#)). Thus, the AC power cords cannot be used with DC power supplies.

The gauge size of the installation wiring will be dependent on the following factors:

- The input rating of the power supply (10A max for the 300 W supply)
- Temperature rating of the wire insulation (assumed 60 C by US National Electric Code)
- Maximum ambient temperature of the installation
- Length of the wires from the switch to the DC power source
- Whether the supply wiring is bundled with other current carrying conductors and whether or not the wire bundles will be enclosed in some sort of protective raceway.

Since some of the above listed factors are installation dependent, we recommend that DC installations be done by qualified service personnel in accordance with local and national electrical code requirements for the specific country of installation.



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**Caution**

Power supplies for the Cisco 9100 Series switches look similar but they differ slightly. Be sure to use the correct power supply designated for your Cisco 9100 Series switch. Using an incorrect power supply will not provide redundant power in the case of a power supply failure.

## Removing Power Supplies

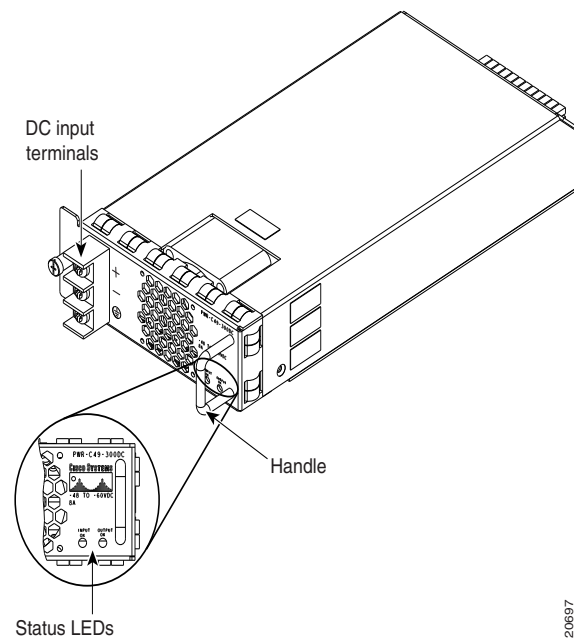
**Note**

The new DC power supply does not have a built-in power switch, unlike the AC power supply.

To remove a DC power supply, follow these steps:

- Step 1** Turn the power switch, breaker, or other power disconnect device to off (0) position on the actual DC power source.
- Step 2** Disconnect the wires from the DC power supply terminal blocks and as a safety measure cover the exposed bare wire ends.
- Step 3** Loosen the captive screw.
- Step 4** Grasp the power supply handle and slide the power supply out of the switch. See [Figure 2-25](#).

**Figure 2-25** Cisco MDS 9100 Series DC Power Supply



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## Installing Power Supplies

To install the 300-W DC-input power supplies, follow these steps:

- Step 1** Turn OFF the DC power source and connect the two DC wires to the DC power supply terminal blocks.



**Note** Ensure that the system (earth) ground connection has been made.

- Step 2** Slide the power supply into the power supply bay. Make sure that the power supply is fully seated in the bay. Turn ON the DC power supply source and ensure that the input LED is green and indicates an OK condition, but the output LED is red.

- Step 3** Switch off the DC power source and switch it on again.

- Step 4** Ensure that the output LED is green. The switch can now receive the down converted 12 VDC from the inserted DC power supply.

- Step 5** Tighten the power supply captive screw.

- Step 6** Verify power supply operation by checking that the power supply (P/S) LED in the front panel is green. If the LED is not green, see the *Cisco MDS 9000 Family Troubleshooting Guide*.

## Removing and Installing Fan Modules

This section provides instructions for removing and installing the fan modules for the Cisco MDS 9148 Switch, Cisco MDS 9140 Switch and the Cisco MDS 9120 Switch. The Cisco MDS 9124 Switch does not have field-replaceable fan modules.

### Removing a Fan Module on the Cisco MDS 9148 Cisco MDS 9140 Switch, the Cisco MDS 9134 Switch, and the Cisco MDS 9120 Switch

The fan module is designed to be removed and replaced while the system is operating without presenting an electrical hazard or damaging the system.



#### Caution

The Cisco MDS 9000 Family has internal temperature sensors that are capable of shutting down the system if the temperature at different points within the chassis exceed certain safety thresholds. To be effective, the temperature sensors require the presence of airflow; therefore, in the event a fan module is removed from the chassis, the Cisco MDS 9000 Family will be shut down after five minutes to prevent potentially undetectable overheating. However, the switches will shut down sooner if the higher-level temperature threshold is exceeded.



#### Warning

**When removing the fan tray, keep your hands and fingers away from the spinning fan blades. Let the fan blades completely stop before you remove the fan tray.** Statement 258

To remove the existing fan module, follow these steps:

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- 
- Step 1** Locate the fan module in the back of the switch.
  - Step 2** Slide the seating tabs toward the center of the fan module.
  - Step 3** Grasp the fan module handle and pull it outward.
  - Step 4** Pull the fan module out of the switch and put it in a safe place.
-

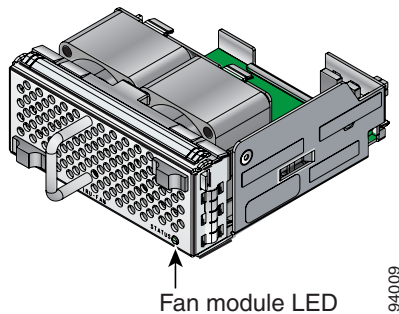
*Send documentation comments to [mdsfeedback-doc@cisco.com](mailto:mdsfeedback-doc@cisco.com)*

## Installing a Fan Module

To install a new fan module, follow these steps:

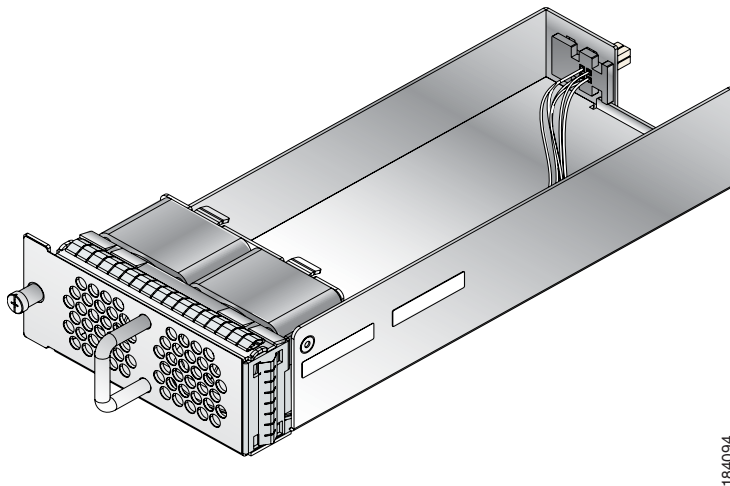
- Step 1** Position the fan module with the LED oriented away from the back of the switch. [Figure 2-26](#) shows the fan module for the Cisco MDS 9120 Switch and the Cisco MDS 9140 Switch. [Figure 2-27](#) shows the fan module for the Cisco MDS 9134 Switch and the Cisco MDS 9134 Switch.
- Step 2** Slide the fan module into the switch until it clicks into place.

**Figure 2-26** Cisco MDS 9100 Series Fan Module



[Figure 2-27](#) shows the Cisco MDS 9148 and the MDS 9134 fan module.

**Figure 2-27** Cisco MDS 9148 and MDS 9134 Fan Module



### Caution

Although the fan modules for the Cisco MDS 9134 and Cisco MDS 9148 switches appear to be similar, there is a difference between the two with their airflow directions. The airflow for MDS 9134 is from front to back where as the airflow for the MDS 9148 is from back to front. Ensure that you connect the correct fan module designated for your Cisco MDS 9100 series switch. Connecting an incorrect fan module may overheat the system, which may result in system failure.

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## Verifying the Fan Module

To verify that the new fan module is installed correctly, follow these steps:

- 
- Step 1** Listen for the fans; you should immediately hear them operating. If you do not hear them, ensure that the fan module is inserted completely in the switch and the faceplate is flush with the switch back panel.
  - Step 2** Verify that the fan module LED is green. If the LED is orange, then one fan has failed in this fan module; if the LED is red, then both fans have failed in this fan module.
  - Step 3** Contact your customer service representative for assistance if, after several attempts, the fans do not operate or you experience trouble with the installation.

**Note**

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If you purchased this product through a Cisco reseller, contact the reseller directly for technical support. If you purchased this product directly from Cisco, contact Cisco Technical Support at this URL:  
[http://www.cisco.com/en/US/support/tsd\\_cisco\\_worldwide\\_contacts.html](http://www.cisco.com/en/US/support/tsd_cisco_worldwide_contacts.html)

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## CHAPTER 3

# Connecting the Cisco MDS 9100 Series

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The Cisco MDS 9100 Series provides the following types of ports:

- Console port (Interface Module)—An RS-232 port that you can use to create a local management connection.
- MGMT 10/100 Ethernet port (Interface Module)—An Ethernet port that you can use to access and manage the switch by IP address, such as through the CLI or Fabric Manager.
- Fibre Channel ports (Supervisor and Switching Modules)—Fibre Channel ports that you can use to connect to the SAN, or for in-band management.

This chapter describes how to connect the various components of the Cisco MDS 9100 Series Fixed Configuration Fabric Switch, and it includes the following information:

- [Preparing for Network Connections, page 3-1](#)
- [Connecting the Console Port, page 3-1](#)
- [Connecting the 10/100 and 10/100/1000 Ethernet Management Port, page 3-4](#)
- [Connecting to a Fibre Channel Port, page 3-4](#)

## Preparing for Network Connections

When preparing your site for network connections to the Cisco MDS 9100 Series switch, consider the following for each type of interface:

- Cabling required for each interface type
- Distance limitations for each signal type
- Additional interface equipment needed

Before installing the component, have all additional external equipment and cables available.

## Connecting the Console Port

This section describes how to connect the RS-232 console port to a PC. The console port allows you to perform the following functions:

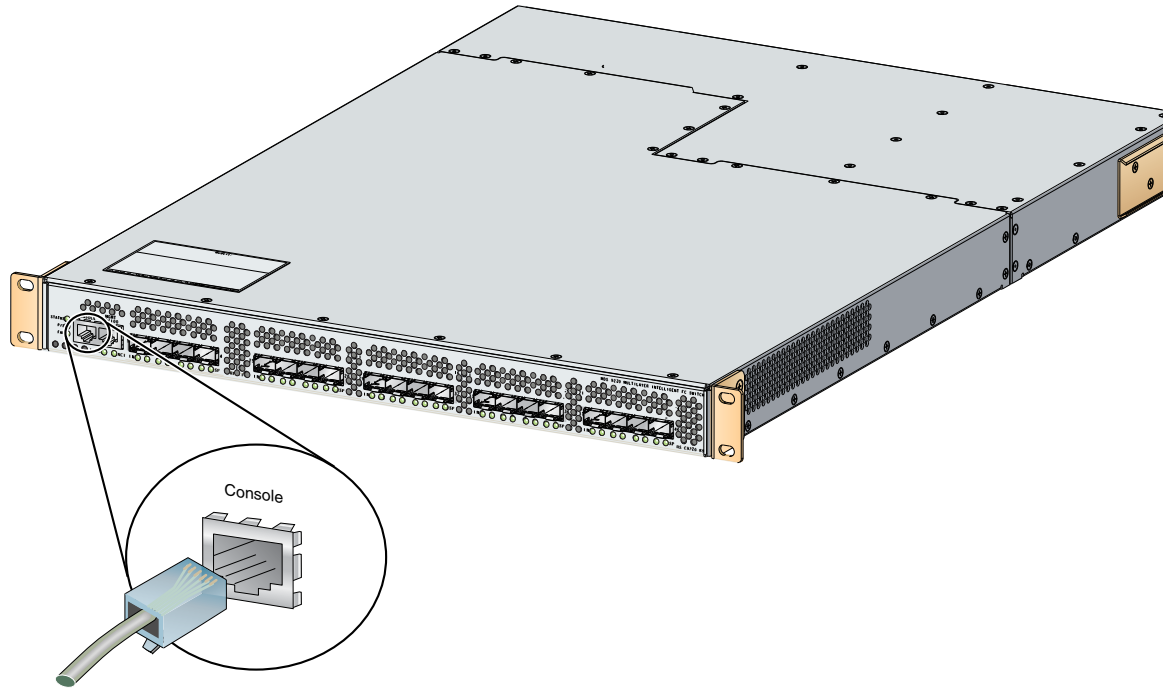
- Configure the switch from the CLI.
- Monitor network statistics and errors.
- Configure SNMP agent parameters.

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- Download software updates to the switch or distribute software images residing in flash memory to attached devices.

The console port, located on the front panel, is shown in [Figure 3-1](#).

**Figure 3-1** Connecting the Console Cable



## Connecting the Console Port to a PC

You can connect the console port to a PC serial port for local administrative access to the Cisco MDS 9100 Series switch.



### Note

The PC must support VT100 terminal emulation. The terminal emulation software—frequently a PC application such as HyperTerminal Plus—makes communication between the Cisco MDS 9100 Series switch and your PC possible during setup and configuration.

To connect the console port to a PC, follow these steps:

**Step 1** Configure the baud rate and character format of the PC terminal emulation program to match the following management port default characteristics:

- 9600 baud
- 8 data bits
- 1 stop bit
- No parity



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- Step 2** Connect the supplied RJ-45 to DB-9 female adapter or RJ-45 to DB-25 female adapter (depending on your PC connection) to the PC serial port.
- Step 3** Connect one end of the supplied console cable (a rollover RJ-45 to RJ-45 cable) to the console port. (See [Figure 3-1](#).) Connect the other end to the RJ-45 to DB-9 (or RJ-45 to DB-25) adapter at the PC serial port.
- 

## Connecting a Modem to a Console Port



### Caution

Do not connect the console port to a modem while the switch is booting. Connect the console port to a modem either before powering the switch on or after the switch has completed the boot process.

---

Switches running Cisco MDS SAN-OS Release 1.2(2a) or later and Cisco MDS NX-OS Release 4.1(1b) or later support connecting the console port to a modem.

To connect the console port to a modem before the switch is powered on, follow these steps:

---

- Step 1** Connect the supplied console cable (a rollover RJ-45 to RJ-45 cable) to the console port (see [Figure 3-1](#)).
- Step 2** Connect the other end of the console cable to the supplied RJ-45 to DB-25 adapter.
- Step 3** Connect the RJ-45-to-DB-25 adapter to the DB-25 port on the modem.
- Step 4** Power on the switch. The switch boots automatically, and the following default console port characteristics are applied to the modem connection:
- 9600 baud
  - 8 data bits
  - 1 stop bit
  - No parity
  - Default initialization string (ATE0Q1&D2&C1S0=1\015) if previously configured
- 



### Note

For instructions on how to change these settings, see the *Cisco Fabric Manager Fundamentals Configuration Guide* for instructions on how to change these settings.

---

To connect the console port to a modem after the switch is powered on, follow these steps:

---

- Step 1** Ensure that the system has completed booting and the system image is running.
- Step 2** Connect the supplied console cable (a rollover RJ-45 to RJ-45 cable) to the console port (see [Figure 3-1](#)).
- Step 3** Connect the other end of the console cable to the supplied RJ-45 to DB-25 adapter.
- Step 4** Connect the RJ-45-to-DB-25 adapter to the DB-25 port on the modem.
- Step 5** Initialize and configure the modem as specified in the *Cisco Fabric Manager Fundamentals Configuration Guide* and the *Cisco NX-OS Fundamentals Configuration Guide*.
-

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## Connecting the 10/100 and 10/100/1000 Ethernet Management Port

The autosensing 10/100 and 10/100/1000 Ethernet management port is located on the left side of the front panel (labeled 10/100/1000 MGMT), to the right of the Console port. This port is used for out-of-band management of the Cisco MDS 9100 Series switches.



### Note

Currently, only the Cisco MDS 9148 Multilayer Fabric Switch provides the 10/100/1000 Ethernet Management port.

Use a modular, RJ-45, straight-through UTP cable to connect the 10/100 management Ethernet port to external hubs and switches. To connect to a router, use a crossover cable.

## Connecting to a Fibre Channel Port

The Fibre Channel ports are compatible with LC-type fiber-optic SFP and SFP+ (8Gbps) transceivers and cables (see [“Removing and Installing Cables into SFP Transceivers”](#) section on page 3-7). You can use these ports to connect to the SAN or for in-band management. For information about configuring the switch for in-band management, see the *Cisco Fabric Manager Fundamentals Configuration Guide* and the *Cisco NX-OS Fundamentals Configuration Guide*.

The Cisco MDS 9000 Family supports both Fibre Channel and Gigabit Ethernet protocols for SFP transceivers. Each transceiver must match the transceiver on the other end of the cable, and the cable must not exceed the stipulated cable length for reliable communications. SFP transceivers can be ordered separately or with the Cisco MDS 9100 Series.



### Note

Verify that the transceiver and cable type, both have LC connectors and are the required type for longwave and shortwave transmission and the required distances. The transceiver label generally lists the model and wavelength.



### Warning

**Class 1 laser product.** Statement 1008



### Warning

**Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051



### Caution

Wear an ESD wrist strap connected to the chassis when handling transceivers. Keep optical connectors covered when not in use, and do not touch connector ends. The fiber-optic connectors must be free of dust, oil, and other contaminants.

This section includes the following information:

- [Removing and Installing SFP Transceivers, page 3-5](#)
- [Removing and Installing Cables into SFP Transceivers, page 3-7](#)

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- [Maintaining SFP Transceivers and Fiber-Optic Cables, page 3-9](#)

## Removing and Installing SFP Transceivers



### Caution

Removing and installing an SFP transceiver can shorten its useful life. Do not remove and insert SFP transceivers more often than is absolutely necessary. We recommend disconnecting cables before installing or removing SFP transceivers to prevent damage to the cable or transceiver.



### Note

Use only Cisco SFP transceivers on the Cisco MDS 9100 Series. Each Cisco SFP transceiver is encoded with model information that enables the switch to verify that the SFP transceiver meets the requirements for the switch.



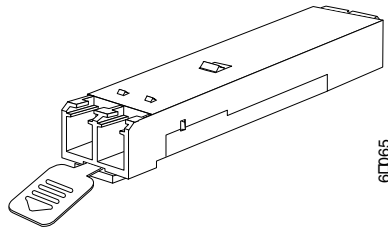
### Note

On the Cisco MDS 9124 Switch, the tabs on the SFP transceivers in the top row are at the bottom of the port. The tabs on the SFP transceivers in the bottom row, are at the top of the port.

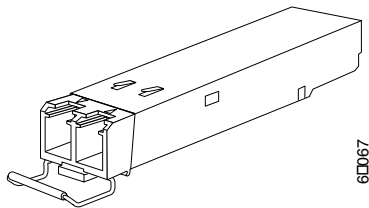
The Cisco MDS 9000 Family supports SFP transceivers with the following two types of latching devices:

- Mylar tab latch ([Figure 3-2](#))
- Bale-clasp latch ([Figure 3-3](#))

**Figure 3-2** SFP Transceiver with Mylar Tab Latch



**Figure 3-3** SFP Transceiver with Bale-Clasp Latch



## Installing an SFP Transceiver

To install an SFP transceiver, follow these steps:

- Step 1** Attach an ESD-preventive wrist strap and follow its instructions for use.

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**Caution** If the transceiver does not install easily, ensure it is correctly oriented and the tab or clasp are in the correct position before continuing.

- Step 2** Remove the dust cover from the port cage.
- Step 3** Remove the dust cover from the port end of the transceiver.
- Step 4** Insert the transceiver into the port:
- If the transceiver has a mylar tab latch, orient the transceiver with the tab on the bottom, and then gently insert the transceiver into the port until it clicks into place.
  - If the transceiver has a bale-clasp latch, orient the transceiver with the bale clasp on the bottom, close the bale clasp by pushing it up and over the transceiver, and then gently insert the transceiver into the port until it clicks into place.
- Step 5** Insert or leave the dust plug in the cable end of the transceiver if a cable is not being installed in the transceiver.

## Removing an SFP Transceiver

To remove an SFP transceiver, follow these steps:

- Step 1** Attach an ESD-preventive wrist strap and follow its instructions for use.
- Step 2** Perform these steps if cable is installed in the transceiver:
- a. Record the cable and port connections for later reference.
  - b. Press the release latch on the cable, grasp the connector near the connection point, and gently pull the connector from the transceiver.
  - c. Insert a dust plug into the connector on the cable.
  - d. Insert a dust plug into the cable end of the transceiver.



**Tip** If the transceiver does not remove easily in the next step, push the transceiver all the way back in and then ensure that the latch is in the correct position before continuing.

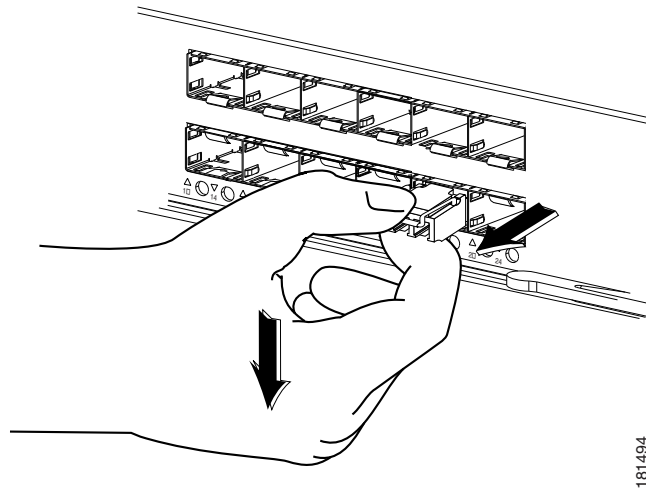
- Step 3** Remove the transceiver from the port:
- If the transceiver has a mylar tab latch, gently pull the tab straight out (do not twist), and then pull the transceiver out of the port.
  - If the transceiver has a bale-clasp latch, open the clasp by pressing it downwards, and then pull the transceiver out of the port.



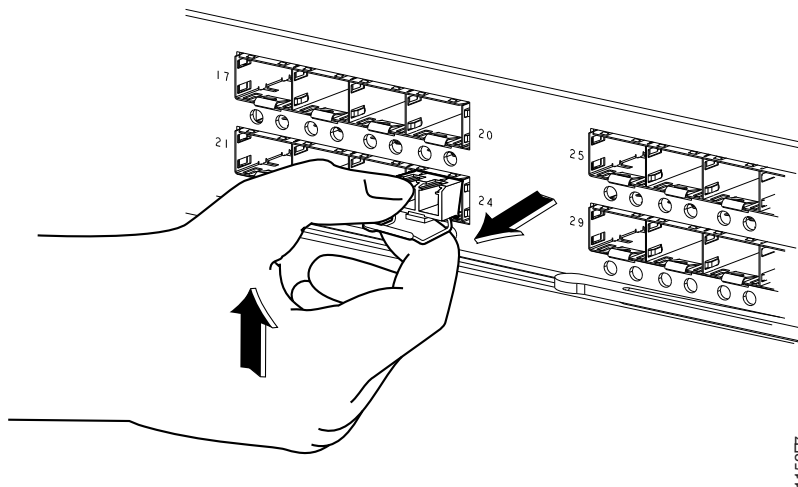
**Note** If you have difficulty removing a bale clasp SFP transceiver, you should reseal the SFP by returning the bale clasp in the up position, and then pressing the SFP inward and upward into the cage (inward and downward on the bottom row of the Cisco MDS 9124 Switch). Next, lower the bale clasp and pull the SFP straight out with a slight upward lifting force (slight downward force on the bottom row of the Cisco MDS 9124 Switch). (See [Figure 3-4](#) and [Figure 3-5](#).) Be careful not to damage the port cage during this process.

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**Figure 3-4** *Alternate Removal Method for Bale Clasp SFP Transceivers in the Cisco MDS 9124 Switch*



**Figure 3-5** *Alternate Removal Method for Bale Clasp SFP Transceivers in the Cisco MDS 9140 Switch and the Cisco MDS 9120 Switch*



- Step 4** Insert a dust cover into the port end of the transceiver and place the transceiver on an antistatic mat or into a static shielding bag if you plan to return it to the factory.
- Step 5** Protect the optical cage by inserting a clean cover if another transceiver is not being installed.

## Removing and Installing Cables into SFP Transceivers



### Caution

To prevent damage to the fiber-optic cables, do not place more tension on them than the rated limit and do not bend to a radius of less than one inch if there is no tension in the cable, or two inches if there is tension in the cable.

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## Installing a Cable into an SFP Transceiver



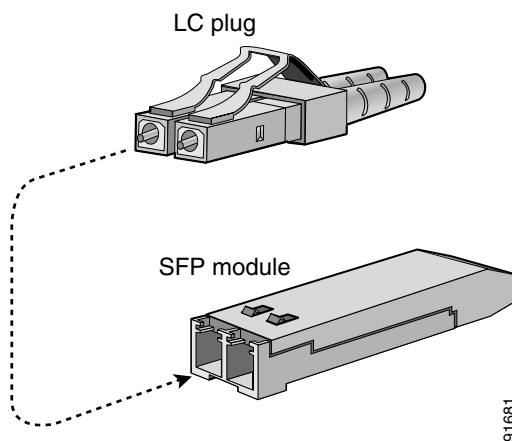
### Caution

To prevent possible damage to the cable or transceiver, install the transceiver in the port before installing the cable in the transceiver.

To install a cable into a transceiver, follow these steps:

- Step 1** Attach an ESD-preventive wrist strap and follow its instructions for use.
- Step 2** Remove the dust cover from the connector on the cable.
- Step 3** Remove the dust cover from the cable end of the transceiver.
- Step 4** Align the cable connector with the transceiver and insert the connector into the transceiver until it clicks into place. (See [Figure 3-6](#)).

**Figure 3-6** Connecting the LC-Type Cable to a Fibre Channel Port



### Caution

If the cable does not install easily, ensure it is correctly oriented before continuing.

For instructions on verifying connectivity, see the *Cisco Fabric Manager Fundamentals Configuration Guide* and the *Cisco NX-OS Fundamentals Configuration Guide*.

## Removing a Cable from an SFP Transceiver



### Caution

When pulling a cable from a transceiver, grip the body of the connector. Do not pull on the jacket sleeve, because this can compromise the fiber-optic termination in the connector.



### Caution

If the cable does not remove easily, ensure that any latch present on the cable has been released before continuing.

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To remove the cable, follow these steps:

- 
- |               |  |
|---------------|--|
| <b>Step 1</b> | Attach an ESD-preventive wrist strap and follow its instructions for use.  |
| <b>Step 2</b> | Press the release latch on the cable, grasp the connector near the connection point, and gently pull the connector from the transceiver. |
| <b>Step 3</b> | Insert a dust plug into the cable end of the transceiver.  |
| <b>Step 4</b> | Insert a dust plug onto the end of the cable.  |
- 

## Maintaining SFP Transceivers and Fiber-Optic Cables

SFP transceivers and fiber-optic cables must be kept clean and dust-free to maintain high signal accuracy and prevent damage to the connectors. Attenuation (loss of light) is increased by contamination, and it should be kept below 0.35 dB.

Follow these maintenance guidelines:

- SFP transceivers are static sensitive. To prevent ESD damage, wear an ESD-preventive wrist strap that is connected to the chassis.
- Do not remove and insert a transceiver more often than necessary. Repeated removals and insertions can shorten its useful life.
- Keep all optical connections covered when not in use. If they become dusty, clean before using to prevent dust from scratching the fiber-optic cable ends.
- Do not touch ends of connectors. This prevents fingerprints and other contamination of the connectors.
- Clean regularly; the required frequency of cleaning depends upon the environment. In addition, clean connectors if they are exposed to dust or accidentally touched. Both wet and dry cleaning techniques can be effective; refer to your site's fibre-optic connection cleaning procedures.
- Inspect routinely for dust and damage. If damage is suspected, clean and then inspect fiber ends under a microscope to determine if damage has occurred.

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## APPENDIX A

# Cabinet and Rack Installation

---

This appendix includes the following information:

- [Cabinet and Rack Requirements, page A-1](#)
- [Cisco MDS 9000 Family Telco and EIA Shelf Bracket, page A-3](#)

## Cabinet and Rack Requirements

This section provides the Cisco MDS 9000 Family requirements for the following types of cabinets and racks, assuming an external ambient air temperature range of 0 to 40°C:

- Standard perforated cabinets
- Solid-walled cabinets with a roof fan tray (bottom to top cooling)
- Standard open racks
- Telco racks



### Note

If you are selecting an enclosed cabinet, we recommend one of the thermally validated types listed above: standard perforated or solid-walled with a fan tray.

---

## General Requirements for Cabinets and Racks

The cabinet or rack must be one of the following rack types:

- Standard 19-in. four-post EIA cabinet or rack, with mounting rails that conform to English universal hole spacing per section 1 of ANSI/EIA-310-D-1992. See the [“Requirements Specific to Perforated Cabinets”](#) section on page A-2 and [“Requirements Specific to Solid-Walled Cabinets”](#) section on page A-3.
- Standard two-post telco rack, with mounting rails that conform to English universal hole spacing per section 1 of ANSI/EIA-310-D-1992. See the [“Requirements Specific to Telco Racks”](#) section on page A-3.

The cabinet or rack must also meet the following requirements:

- The minimum vertical rack space per chassis should be 1 RU (rack unit), equal to 1.75 in. (4.4 cm).
- The width between the rack-mounting rails must be at least 17.75 in. (45.1 cm). For four-post EIA racks, this is the distance between the two front rails.

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- For four-post EIA cabinets (perforated or solid-walled):
  - The minimum spacing for bend radius for fiber-optic cables should have the front mounting rails of the cabinet offset from the front door by a minimum of 3 in. (7.6 cm), and a minimum of 5 in. (12.7 cm) if cable management brackets are installed on the front of the chassis.
  - The distance between the outside face of the front mounting rail and the outside face of the back mounting rail should be 23.5 to 34.0 in. (59.7 to 86.4 cm) to allow for rear bracket installation.
  - There should be a minimum of 2.5 in. (6.4 cm) of clear space between the side edge of the chassis and the side wall of the cabinet. No sizeable flow obstructions should be immediately in the way of the chassis air intake or exhaust vents.

**Note**

---

Optional jumper power cords are available for use in a cabinet. See the “[Jumper Power Cord](#)” section on [page C-6](#).

---

## Requirements Specific to Perforated Cabinets

In addition to the requirements listed in the “[General Requirements for Cabinets and Racks](#)” section on [page A-1](#), perforated cabinets must meet the following requirements:

- The front and rear doors must have at least a 60 percent open area perforation pattern, with at least 15 sq. in. of open area per rack unit of door height.
- We recommend that the roof be perforated with at least 20 percent open area, unless the cabinet only contains Cisco MDS 9100 Series switches, in which case the roof does not have to be perforated.
- We recommend an open or perforated cabinet floor to enhance cooling but it is not required.

## Reference Perforated Cabinet

A perforated cabinet that conforms to the above requirements is available from Rittal Corporation:

**Rittal Corporation**

One Rittal Place

Springfield, OH 45504

Phone: (800) 477-4000

Cabinet P/N: Rittal 9969427

Cabinet description: PS-DK/OEM Cabinet Assembly, 1998 x 600 x 1000 (H x W x D) (42U)

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## Requirements Specific to Solid-Walled Cabinets

In addition to the requirements listed in the [“General Requirements for Cabinets and Racks”](#) section on [page A-1](#), solid-walled cabinets must meet the following requirements:

- A roof-mounted fan tray and an air cooling scheme in which the fan tray pulls air in at the bottom of the cabinet and exhausts it out the top, with a minimum of 500 cfm of airflow exiting the cabinet roof through the fan tray.
- Nonperforated (solid and sealed) front and back doors and side panels so that air travels predictably from bottom to top.
- The overall cabinet depth should be 36 to 42 in. (91.4 to 106.7 cm) to allow the doors to close and adequate airflow.
- A minimum of 150 sq. in. (968 sq. cm) of open area at the floor air intake of the cabinet.
- The lowest piece of equipment should be installed a minimum of 1.75 in. (4.4 cm) above the floor openings to prevent blocking the floor intake.

## Requirements Specific to Standard Open Racks

In addition to the requirements listed in the [“General Requirements for Cabinets and Racks”](#) section on [page A-1](#), if mounting the chassis in an open rack (no side panels or doors), ensure that the rack meets the following requirements:

- Width between two front mounting rails: minimum of 17.75 in. (45.1 cm)
- Minimum vertical rack space per chassis: 1 rack unit (RU), equal to 1.75 in. (4.4 cm)
- The distance between the outside face of the front mounting rail and the outside face of the back mounting rail should be 23.5 to 34.0 in. (59.7 to 86.4 cm) to allow for rear bracket installation.
- The distance between the chassis air vents and any walls should be 2.5 in. (6.4 cm).

## Requirements Specific to Telco Racks

In addition to the requirements listed in the [“General Requirements for Cabinets and Racks”](#) section on [page A-1](#), telco racks should meet the following requirements:

- The width of the rack between the two rack-mounting rails should be at least 17.75 in. (45.1 cm).
- The distance between the chassis air vents and any walls should be 2.5 in. (6.4 cm).

## Cisco MDS 9000 Family Telco and EIA Shelf Bracket

The optional telco and EIA Shelf Bracket Kit (part number DS-SHELF=) can temporarily or permanently support the Cisco MDS 9100 Series during installation. Once the front rack-mount brackets are securely attached to the rack-mounting rails, the shelf bracket can be removed.

This kit supports the following configurations:

- A Cisco MDS 9100 Series switch in a two-post telco rack
- A Cisco MDS 9100 Series switch in a four-post EIA rack

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**Note**

This optional kit is not provided with the switch; to order the kit, contact your switch supplier.

This section describes the procedure for installing a Cisco MDS 9000 Family switch in a rack or cabinet using the optional telco and EIA Shelf Bracket Kit. This section includes the following information:

- [Rack-Mounting Guidelines, page A-4](#)
- [Before Installing the Shelf Brackets, page A-5](#)
  - [Required Equipment, page A-5](#)
  - [Installing the Shelf Bracket Kit into a Four-Post EIA Rack, page A-7](#)
  - [Installing the Shelf Bracket Kit into a Two-Post Telco Rack, page A-5](#)
  - [Installing the Switch on the Shelf Brackets, page A-8](#)
  - [Removing the Shelf Bracket Kit \(Optional\), page A-9](#)

## Rack-Mounting Guidelines


**Caution**

If the rack is on wheels, ensure that the brakes are engaged or the rack is otherwise stabilized.


**Caution**

If installing this kit in an EIA rack, attach the switch to all four rack-mounting rails; the EIA rails may not be thick enough to prevent flexing of the shelf brackets if only two rails are used.

Before rack-mounting the chassis, ensure that the cabinet or rack meets the following requirements:

- The specifications listed in the “[Cabinet and Rack Requirements](#)” section on [page A-1](#).
- The depth of the rack between the front and rear mounting rails is at least 18 in. (45.7 cm) but less than or equal to 30 in. (76.2 cm). This is specific to four-post EIA cabinets or racks.
- The airflow and cooling are adequate and there is sufficient clearance around the air vents on the switch, as described in [Appendix B, “Technical Specifications.”](#) This is particularly important to verify if you are installing the switch in an enclosed cabinet.
- The rack has sufficient vertical clearance for the chassis plus two rack units for the shelf brackets, and any desired clearance for the installation process.
- The rack meets the minimum rack load ratings per rack unit (RU) listed in the following table.

Rack Type	MDS 9513	MDS 9509	MDS 9506	MDS 9216	MDS 9100
EIA (4-post)	45 lb	45 lb	30 lb	15 lb	7.5 lb
Telco (2 post)	Do not use.	Do not use.	60 lb	30 lb	15 lb

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## Before Installing the Shelf Brackets

Before installing the shelf brackets, inspect the contents of your kit. [Table A-1](#) lists the contents of the shelf bracket kit.

**Table A-1** Contents of Shelf Bracket Kit

Quantity	Part Description
2	Slider brackets
2	Shelf brackets
1	Crossbar
2	10-32 x 3/8-in. Phillips pan-head screws
16	12-24 x 3/4-in. Phillips screws
16	10-24 x 3/4-in. Phillips screws

## Required Equipment

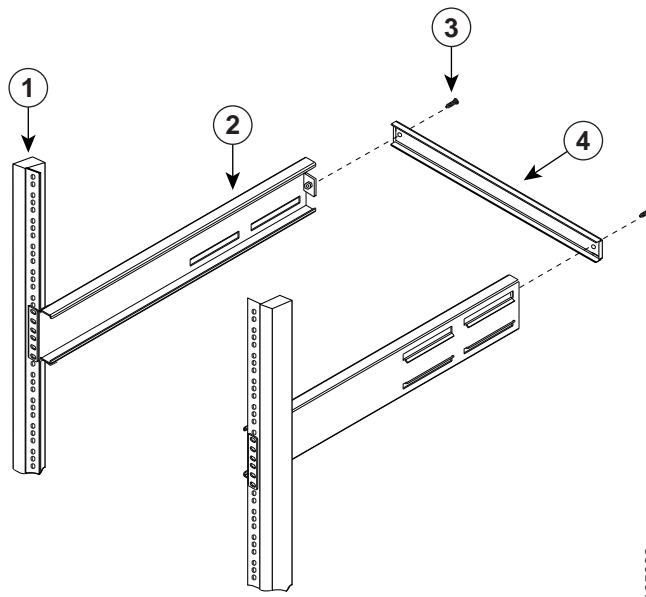
You need the following equipment for this installation:

- Number 2 Phillips screwdriver
- Tape measure and level (to ensure shelf brackets are level)

## Installing the Shelf Bracket Kit into a Two-Post Telco Rack

[Figure A-1](#) shows the installation of the shelf bracket kit into a two-post telco rack.

**Figure A-1** Installing the Shelf Bracket Kit into a Telco Rack



1	Rack-mounting rail (2x)	3	10-32 screws (2x)
2	Shelf bracket (2x)	4	Crossbar

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To install the shelf brackets in a telco rack, follow these steps:

- 
- Step 1** Position a shelf bracket inside a rack-mounting rail as shown in [Figure A-1](#) and align the screw holes at the front of the shelf bracket with the holes in the rack-mounting rail. Then attach the shelf bracket to the rack-mounting rail using a minimum of four 12-24 or 10-24 screws.



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**Note** The bottom hole of the shelf bracket should align with the bottom hole of a rack unit on the rack-mounting rail (the hole immediately above the 1/2-in. spacing).

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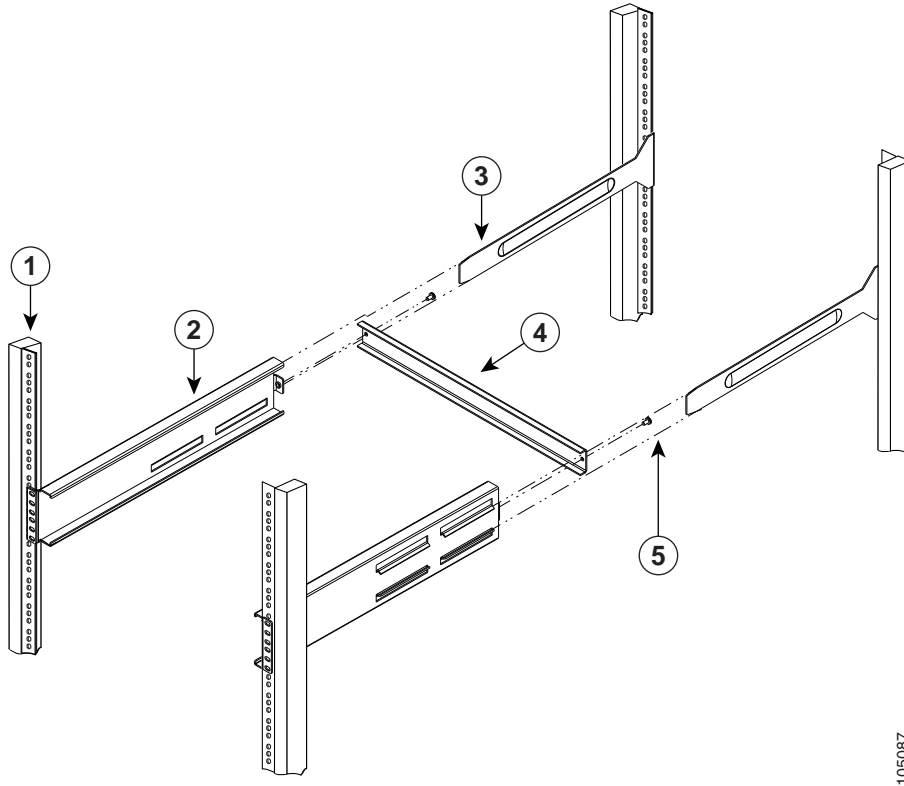
- Step 2** Repeat with the other shelf bracket.
- Step 3** Verify that the shelf brackets are at the same height (using the level or tape measure as desired).
- Step 4** Attach the crossbar to the rear of the shelf brackets as shown in [Figure A-1](#), using the 10-32 screws.
-

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## Installing the Shelf Bracket Kit into a Four-Post EIA Rack

Figure A-2 shows the installation of the shelf bracket kit into a four-post EIA rack.

**Figure A-2** Installing the Shelf Bracket Kit into an EIA Rack



105087

1	Rack-mounting rail (4x)	4	Crossbar
2	Shelf bracket (2x)	5	10-32 screws (2x)
3	Slider rail (2)		

To install the shelf brackets in an EIA rack, follow these steps:

- Step 1** Position a shelf bracket inside the rack-mounting rails as shown in Figure A-2. Align the screw holes at the front of the shelf bracket with the holes in the front rack-mounting rail. Then attach the shelf bracket to the front rack-mounting rail using a minimum of four 12-24 or 10-24 screws.



**Note** The bottom hole of the shelf bracket should align with the bottom hole of a rack unit on the rack-mounting rail (the hole immediately above the 1/2-in. spacing).

- Step 2** Repeat with the other shelf bracket.
- Step 3** Verify that the shelf brackets are at the same height (using the level or tape measure as desired).

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- Step 4** Attach the crossbar to the shelf brackets as shown in [Figure A-2](#), using the 10-32 screws.
- Step 5** Insert the slider rails into the shelf brackets as shown in [Figure A-2](#). Then attach them to the rear rack-mounting rails using a minimum of four 12-24 or 10-24 screws.

## Installing the Switch on the Shelf Brackets

This section provides general instructions for installing the switch on top of the shelf brackets. For detailed installation instructions, see the “[Installing the Switch in a Cabinet or Rack](#)” section on [page 2-5](#).



**Warning**

**This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.**

Statement 1017



**Warning**

**Only trained and qualified personnel should be allowed to install, replace, or service this equipment.**

Statement 1030



**Note**

Before you install, operate, or service the system, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family* for important safety information.

To install the switch on top of the shelf brackets, follow these steps:

- Step 1** Verify that the shelf brackets are level and securely attached to the rack-mounting rails, the crossbar is securely attached to the shelf brackets, and the rack is stabilized.
- Step 2** Slide the switch onto the shelf brackets, ensuring that it is squarely positioned.
- Step 3** Attach the switch to the rack-mounting rails. See the “[Installing the Switch in a Cabinet or Rack](#)” section on [page 2-5](#).



**Caution**

We recommend grounding the chassis, even if the rack is already grounded. A grounding pad with two threaded M4 holes is provided on the chassis for attaching a grounding lug.



**Note**

The grounding lug must be NRTL listed and compatible with copper conductors. Only copper conductors (wires) must be used and the copper conductor must comply with National Electrical Code (NEC) for ampacity.



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## Removing the Shelf Bracket Kit (Optional)

The shelf bracket kit can be removed once the Cisco MDS 9100 Series switch has been installed in a four-post EIA rack, and both front rack-mount brackets and both C brackets are securely attached to the rack-mounting rails.

To remove the shelf bracket kit, follow these steps:

- 
- Step 1** Remove the screws fastening the slider brackets to the rear rack-mounting rails, and then slide the slider brackets out of the shelf brackets.
  - Step 2** Remove the screws fastening the crossbar to the shelf brackets, and then remove the crossbar.
  - Step 3** Remove the screws fastening the shelf brackets to the front rack-mounting rails and remove the shelf brackets from the rack.
-

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## APPENDIX B

# Technical Specifications

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This appendix includes the following technical specifications for the Cisco MDS 9100 Series Fixed Configuration Fabric Switch:

- [Switch Specifications, page B-1](#)
- [Power Specifications, page B-3](#)
- [SFP Transceiver Specifications, page B-6](#)
- [Cisco DWDM SFP Transceivers, page B-12](#)

## Switch Specifications

[Table B-1](#) lists the environmental specifications for the Cisco MDS 9100 Series.

**Table B-1**      *Environmental Specifications for the Cisco MDS 9100 Series*

Description	Specification
Temperature, ambient operating	32 to 104°F (0 to 40°C)
Temperature, ambient nonoperating and storage	-40 to 158°F (-40 to 70°C)
Humidity (RH), ambient (noncondensing) operating	10 to 90%
Humidity (RH), ambient (noncondensing) nonoperating and storage	5 to 95%
Altitude, operating	-197 to 6500 ft (-60 to 2000 m)
Noise levels	60 dB

[Table B-2](#) lists the physical specifications for the Cisco MDS 9100 Series.

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**Table B-2 Cisco MDS 9100 Series Switch Specifications**

Description	Specification
Cisco MDS 9148 Switch Dimensions	Width = 17.51 in. (44.5 cm) Height = 1.72 in. (4.47 cm) Depth = 19.78 in. (50.2 cm)
Cisco MDS 9134 Switch Dimensions	Width = 17.16 in. (43.59 cm) Height = 1.72 in. (4.47 cm) Depth = 18.89 in. (47.98 cm)
Cisco MDS 9124 Switch Dimensions	Width = 17.16 in. (44.45 cm) Height = 1.72 in. (4.45 cm) Depth = 16 in. (40.64 cm)
Cisco MDS 9140 and MDS 9120 Switch Dimensions	Width = 17.2 in. (43.69 cm) Height = 1.75 in. (4.45 cm) Depth = 23.1 in. (58.67 cm) Depth with cable guide = 28.1 in. (71.37 cm)
Rack Unit (RU)	Chassis requires 1 RU (1.75 in. or 4.45 cm)
Weight	22.2 lb (Cisco MDS 9148 Switch and Cisco MDS 9120 Switch chassis with two fan modules and two power supplies installed)  25 lb (Cisco MDS 9140 Switch and Cisco MDS 9120 Switch chassis with two fan modules and two power supplies installed)  20 lb Cisco MDS 9134 Switch with two power supplies installed  16.5 lb (Cisco MDS 9124 Switch with a single power supply installed)  18.5 lb (Cisco MDS 9124 Switch with two power supplies installed)
Power Supply (AC)	300-W AC dual redundant power supply is standard on all Cisco MDS 9100 series switches except Cisco MDS 9124 switch.  In the case of Cisco MDS 9124 switch, dual redundant AC or DC power supplies are optional.

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**Table B-2** Cisco MDS 9100 Series Switch Specifications (continued)

Description	Specification
Power Supply (Spares)	300-W AC power supply spares. Part Number: DS-CAC-300W= (Cisco MDS 9140 Switch and Cisco MDS 9120 Switch) Part Number: DS-C24-300AC= (Cisco MDS 9124 Switch and Cisco MDS 9134 Switch). Part Number: DS-C48-300AC= (Cisco MDS 9148 Switch)
Airflow	Front to back, except for Cisco MDS 9148 switch where it is from back to front.  250 lfm <sup>1</sup> or 42 cfm <sup>2</sup> through the system. A minimum clearance of 2.5 in. (6.4 cm) is required between the chassis air vents and any walls.

1. lfm = linear feet per minute
2. cfm = cubic feet per minute

## Power Specifications

This section includes the following information:

- [General Power Supply Specifications, page B-3](#)
- [Power Supply Requirements and Heat Dissipation Specifications, page B-4](#)
- [Connection Guidelines for AC-Powered Systems, page B-5](#)

## General Power Supply Specifications

[Table B-3](#) lists the specifications for the Cisco MDS 9100 Series AC input power supply.

**Table B-3** Cisco MDS 9100 Series AC Input Power Supply Specifications

AC Input Power Supply	Specification
AC input voltage	Minimum = 85 VAC Nominal = 100 to 240 VAC Maximum = 264 VAC
AC input current rating (maximum)	4.7 A at 85 VAC 3.6 A at 110 VAC 1.8 A at 220 VAC  <b>Note</b> For plug current rating, see the <a href="#">“Jumper Power Cord” section on page C-6</a> .
AC input frequency	Minimum = 47 Hz Nominal = 50 to 60 Hz Maximum = 63 Hz

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**Table B-3 Cisco MDS 9100 Series AC Input Power Supply Specifications**

AC Input Power Supply	Specification
Power supply output capacity	300 W
Power supply output voltage	12 V +/- 6% up to 25 A
Output holdup time	20ms when input > 100 VAC

Table B-4 lists the specifications for the Cisco MDS 9100 Series DC input power supply.

**Table B-4 Cisco MDS 9100 Series DC Input Power Supply Specifications**

DC Input Power Supply	Specification
DC input voltage	-48 VDC to -60 VDC continuous
DC input current rating (maximum)	8 A at -48 VDC 6.67 A at -60 VDC.  <b>Note</b> DC power supply does not use country specific power cords. For more information on DC power supply see <i>Removing and Installing DC Power Supplies</i> section in <i>Installing the Cisco MDS 9100 Series</i> chapter.
Power supply output capacity	300 W
Power supply output voltage	12 V +/- 6% up to 25 A
Output holdup time	8 ms when input > 100 VAC

## Power Supply Requirements and Heat Dissipation Specifications

Table B-5 provides a sample calculation of power and heat dissipation for the Cisco MDS 9100 Series AC input power supply.

**Table B-5 Power and Heat Dissipation for AC Input Power Supply**

Model Number/Module	AC Input Power (watts)	Heat Diss. (BTU/hr)	Input Current		
			85 VAC (amps)	110 VAC (amps)	220 VAC (amps)
Cisco MDS 9148 Switch (with fan modules)	120 maximum	410	1.76	1.36	0.68
Cisco MDS 9134 Switch (with fan modules)	96 maximum	330	1.41	1.10	.55
Cisco MDS 9124 Switch (with fan modules)	80 maximum	330	1.41	.73	.36

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**Table B-5** Power and Heat Dissipation for AC Input Power Supply (continued)

Model Number/Module	AC Input Power (watts)	Heat Diss. (BTU/hr)	Input Current		
			85 VAC (amps)	110 VAC (amps)	220 VAC (amps)
Cisco MDS 9140 Switch (with fan modules)	204 maximum	870	3.0	2.32	1.16
Cisco MDS 9120 Switch (with fan modules)	180 maximum	752	2.65	2.05	1.02



**Tip**

To prevent a loss of input power, ensure that the total maximum load on each circuit supplying the power supply is within the current ratings of the wiring and breakers.

**Table B-6** provides a sample calculation of power and heat dissipation for the Cisco MDS 9100 Series AC input power supply.

**Table B-6** Power and Heat Dissipation for DC Input Power Supply

Model Number/	DC Input Power (watts)	Heat Diss. (BTU/hr)	Input Current	
			48 VDC (amps)	60 VDC (amps)
Cisco MDS 9148 Switch (with fan modules)	Not supported	-	-	-
Cisco MDS 9134 Switch (with fan modules)	96 maximum	332	8.00	6.67
Cisco MDS 9124 Switch (with fan modules)	80 maximum	273	8.00	6.67
Cisco MDS 9140 Switch (with fan modules)	204 maximum	928	5.67	4.53
Cisco MDS 9120 Switch (with fan modules)	180 maximum	819	5.00	4.00

## Connection Guidelines for AC-Powered Systems

For connecting the Cisco MDS 9100 Series switch AC power supplies to the site power source, follow these basic guidelines:

- Each power supply should have its own dedicated branch circuit.

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- For international, circuits should be sized according to local and national codes.
- The AC power receptacles used to plug in the chassis must be the grounding type. The grounding conductors that connect to the receptacles should connect to protective earth ground at the service equipment.

## SFP Transceiver Specifications

The Cisco MDS 9100 Series is compatible with SFP transceivers and cables that have LC connectors. Each transceiver must match the transceiver on the other end of the cable in terms of wavelength, and the cable must not exceed the stipulated cable length for reliable communications.

Cisco SFP transceivers provide the uplink interfaces, laser transmit (TX), and laser receive (RX), and they support 850 to 1610 nm nominal wavelengths, depending upon the transceiver.

Use only Cisco SFP transceivers on the Cisco MDS 9100 Series. Each Cisco SFP transceiver is encoded with model information that enables the switch to verify that the SFP transceiver meets the requirements for the switch. For the list of supported SFP transceivers, see the release notes.

For details of SFP transceivers see the data sheet at the following location:

[http://www.cisco.com/en/US/prod/collateral/ps4159/ps6409/ps4358/product\\_data\\_sheet09186a00801bc698.html](http://www.cisco.com/en/US/prod/collateral/ps4159/ps6409/ps4358/product_data_sheet09186a00801bc698.html)

This section provides the following information:

- [Cisco Fibre Channel SFP Transceivers, page B-6](#)
- [Cisco Gigabit Ethernet/Fibre Channel Transceivers, page B-9](#)
- [Cisco CWDM SFP Transceivers, page B-10](#)

For information about safety, regulatory, and standards compliance, see the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

## Cisco Fibre Channel SFP Transceivers

[Table B-7](#) lists the Fibre Channel SFP transceivers available through Cisco Systems exclusively for the Cisco MDS 9148 Switch.

**Table B-7** Cisco Fibre Channel SFP Transceivers for the Cisco MDS 9148 Switch

Part Number	Description	Type
DS-SFP-FC8G-SW	Cisco 1-, 2-, 4-, or 8-Gbps autosensing SFP+ LC Shortwave Interface	Short wavelength
DS-SFP-FC8G-LW	Cisco 1-, 2-, 4-, or 8-Gbps Autosensing SFP+ LC Longwave Interface	Long wavelength
DS-SFP-FC4G-SW	Cisco 1-, 2-, 4-, or 8-Gbps Autosensing SFP LC Shortwave Interface	Short wavelength
DS-SFP-FC4G-MR	Cisco 1-, 2-, 4-, or 8-Gbps Autosensing SFP LC Longwave (4-km reach) Interface	Medium reach
DS-SFP-FC4G-LW	Cisco 1-, 2-, 4-, or 8-Gbps Autosensing SFP LC Longwave Interface	Long wavelength



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Table B-8 lists the Fibre Channel SFP transceivers available through Cisco Systems for the Cisco MDS 9124 Switch.

**Table B-8 Cisco Fibre Channel SFP Transceivers for the Cisco MDS 9148 Switch, Cisco MDS 9134 Switch, and Cisco MDS 9124 Switch**

Part Number	Description	Type
DS-SFP-FC4G-SW	4-Gbps/2-Gbps/1-Gbps Fibre Channel–short wavelength SFP	Short wavelength
DS-SFP-FC4G-MR	4-Gbps/2-Gbps/1-Gbps Fibre Channel–long wavelength SFP	Long wavelength
DS-SFP-FC4G-LW	4-Gbps/2-Gbps/1-Gbps Fibre Channel–long wavelength SFP	Long wavelength

Table B-9 lists the Fibre Channel SFP transceivers available through Cisco Systems for the Cisco MDS 9140 Switch and the Cisco MDS 9120 Switch.

**Table B-9 Cisco Fibre Channel SFP Transceivers for the Cisco MDS 9140 Switch and the Cisco MDS 9120 Switch**

Part Number	Description	Type
DS-SFP-FC2G-SW	2-Gbps/1-Gbps Fibre Channel–short wavelength SFP	Short wavelength
DS-SFP-FC2G-LW	2-Gbps/1-Gbps Fibre Channel–short wavelength SFP	Short wavelength
DS-SFP-FC2G-LW	2-Gbps/1-Gbps Fibre Channel–long wavelength SFP	Long wavelength

## General Specifications for Cisco Fibre Channel SFP Transceivers

Table B-10 lists general specifications for Cisco Fibre Channel SFP transceivers at 4 Gbps.



**Note**

The cable distances provided are for 4 Gbps.

**Table B-10 General Specifications for Cisco Fibre Channel SFP Transceivers at 4 Gbps**

Description	Short Wavelength		Long Wavelength
Connector type	LC		LC
Wavelength	850 nm		1310 nm
Fiber type	MMF		SMF
Core size	50 microns	62.5 microns	9/125 microns
Cable distance <sup>1</sup>	328.08 yd (300 m)	164.04 yd (150 m)	6.2 miles (10 km)
Transmit power	-9 to -2.5 dBm		-8.4 to -2 dBm

1. Approximate; actual distance may vary depending on fiber quality and other factors.

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Table B-11 lists general specifications for Cisco Fibre Channel SFP transceivers at 2 Gbps.



**Note**

The cable distances provided are for 2 Gbps.

**Table B-11 General Specifications for Cisco Fibre Channel SFP Transceivers**

Description	Short Wavelength		Long Wavelength
Connector type	LC		LC
Wavelength	850 nm		1310 nm
Fiber type	MMF		SMF
Core size	50 microns	62.5 microns	9/125 microns
Cable distance <sup>1</sup>	300 m	150 m	10 km
Transmit power	-10 to -1.5 dBm		-9.5 to -3 dBm

1. Approximate; actual distance may vary depending on fiber quality and other factors.

## Environmental and Electrical Specifications for Cisco Fibre Channel SFP Transceivers

Table B-12 provides the maximum environmental and electrical ratings for Cisco Fibre Channel SFP transceivers.

**Table B-12 Maximum Environmental and Electrical Ratings for Cisco Fibre Channel SFP Transceivers**

Parameter	Symbol	Min.	Max.	Unit
Storage temperature <sup>1</sup>	T <sub>S</sub>	-40	85	°C
Case temperature <sup>1, 2</sup>	T <sub>C</sub>	0	70	°C
Relative humidity <sup>1</sup>	RH	5	95	%
Module supply voltage <sup>1</sup>	V <sub>CC</sub> T,R	3.1	3.5	V

1. Absolute maximum ratings are those values beyond which damage to the device may occur if these limits are exceeded for other than a short period of time. See Reliability Data Sheet for specific reliability performance.
2. Functional performance is not intended, device reliability is not implied, and damage to the device may occur over an extended period of time between absolute maximum ratings and the recommended operating conditions.

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## Cisco Gigabit Ethernet/Fibre Channel Transceivers

**Table B-13** lists the combination Gigabit Ethernet/Fibre Channel (GE/FC) SFP transceivers available through Cisco Systems for the Cisco MDS 9140 Switch and the Cisco MDS 9120 Switch.

**Table B-13 Cisco Gigabit Ethernet / Fibre Channel SFP Transceivers**

Part Number	Description	Type
DS-SFP-FCGE-SW	1-Gbps Ethernet and 1-Gbps/2-Gbps Fibre Channel—short wavelength SFP	Short wavelength
DS-SFP-FCGE-LW	1-Gbps Ethernet and 1-Gbps/2-Gbps Fibre Channel—long wavelength SFP	Long wavelength
DS-SFP-GE-T	1-Gbps Ethernet SFP	

### General Specifications for Cisco GE/FC SFP Transceivers

**Table B-14** lists general specifications for Cisco combination Gigabit Ethernet/Fibre Channel SFP transceivers.



**Note**

The cable distances provided are for 2-Gbps.

**Table B-14 General Specifications for Cisco Gigabit Ethernet/Fibre Channel SFP Transceivers**

Description	Short Wavelength		Long Wavelength
Connector type	LC		LC
Wavelength	850 nm		1310 nm
Fiber type	MMF		SMF
Core size	50 microns	62.5 microns	9/125 microns
Cable distance <sup>1</sup>	300 m	150 m	10 km
Transmit power	-1.5 to -9.5 dBm		-3 to -9.5 dBm

1. Approximate; actual distance may vary depending on fiber quality and other factors.

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## Environmental and Electrical Specifications for Cisco GE/FC SFP Transceivers

Table B-15 provides the maximum environmental and electrical ratings for Cisco GE/FC SFP transceivers.

**Table B-15 Maximum Environmental and Electrical Ratings for Cisco GE/FC SFP Transceivers**

Parameter	Symbol	Min.	Max.	Unit
Storage temperature <sup>1</sup>	T <sub>S</sub>	-40	100	°C
Case temperature <sup>1, 2</sup>	T <sub>C</sub>	0	85	°C
Relative humidity <sup>1</sup>	RH	5	95	%
Module supply voltage <sup>1</sup>	V <sub>CC</sub> T,R	3.1	3.5	V

1. Absolute maximum ratings are those values beyond which damage to the device may occur if these limits are exceeded for other than a short period of time. See Reliability Data Sheet for specific reliability performance.
2. Functional performance is not intended, device reliability is not implied, and damage to the device may occur over an extended period of time between absolute maximum ratings and the recommended operating conditions.

## Cisco CWDM SFP Transceivers

Table B-16 lists the CWDM SFP transceivers available through Cisco Systems. These SFP transceivers are supported by the Cisco MDS 9140 and Cisco MDS 9120 Switch.

**Table B-16 Cisco CWDM SFP Transceivers**

Part Number	Description
DS-CWDM-xxxx	Gigabit Ethernet and 1-Gbps/2-Gbps/4-Gbps Fibre Channel SFP LC interface xxxx where xxxx = 1470, 1490, 1510, 1530, 1550, 1570, 1590, or 1610 nm.
DS-CWDM-MUX-4	Add/drop multiplexer for four CWDM wavelengths.
DS-CWDM-MUX-8	Add/drop multiplexer for eight CWDM wavelengths.
DS-CWDMCHASSIS	Two-slot chassis for CWDM add/drop multiplexers.

Table B-17 lists the color codes of the CWDM SFP transceivers.

**Table B-17 Cisco CWDM SFP Transceivers Color Codes**

Description	Color
Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1-Gbps/2-Gbps/4-Gbps FC	Gray
Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1-Gbps/2-Gbps/4-Gbps FC	Violet
Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1-Gbps/2-Gbps/4-Gbps FC	Blue
Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1-Gbps/2-Gbps/4-Gbps FC	Green
Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1-Gbps/2-Gbps/4-Gbps FC	Yellow
Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1-Gbps/2-Gbps/4-Gbps FC	Orange
Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1-Gbps/2-Gbps/4-Gbps FC	Red
Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1-Gbps/2-Gbps/4-Gbps FC	Brown

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## General Specifications for Cisco CWDM SFP Transceivers

Table B-18 lists general specifications for Cisco CWDM SFP transceivers.

**Table B-18** *General Specifications for Cisco CWDM SFP Transceivers*

Description	Specification
Connector type	LC
Wavelength	1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610 nm
Fiber type	SMF
Core size	9/125 microns
Cable distance <sup>1</sup>	100 km
Transmit power	0 to 5 dBm
Receive sensitivity	-28 to -7 dBm

1. Approximate; actual distance may vary depending on fiber quality and other factors.

## Environmental and Electrical Specifications for Cisco CWDM SFP Transceivers

Table B-19 provides the environmental specifications for CWDM SFP transceivers.

**Table B-19** *Environmental Specifications for Cisco CWDM SFP Transceivers*

Description	Specification
Temperature, ambient operating	32 to 122°F (0 and 50°C)
Temperature, ambient nonoperating and storage	-40 to 185°F (-40 to 85°C)

Table B-20 provides the electrical specifications for CWDM SFP transceivers.

**Table B-20** *Electrical Specifications for Cisco CWDM SFP Transceivers*

Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Current	$I_s$		220	300	mA
Surge Current	$I_{\text{surge}}$			+30	mA
Input voltage	$V_{\text{max}}$	3.1	3.3	3.6	V

## Optical Specifications for Cisco CWDM SFP Transceivers

Table B-21 provides the optical specifications for CWDM SFP transceivers. CWDM SFP transceivers have an optical link budget of 28 decibels (db).



**Note**

The parameters are specified over temperature and at end of life unless otherwise noted.

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**Note**

When shorter distances of single-mode fiber are used, it might be necessary to insert an inline optical attenuator in the link to avoid overloading the receiver.

**Table B-21** *Optical Specifications for Cisco CWDM SFP Transceivers*

Parameter	Symbol	Min.	Typical	Max.	Units	Notes
Transmitter central wavelength	$\lambda_c$	(x-4)	(x+1)	(x+7)	nm	Available center wavelengths: 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610 nm
Wavelength temperature dependence			0.08	0.1	nm/°C	
Side-mode suppression ratio	SMSR	30			dB	
Transmitter optical output power	$P_{out}$	0.0		5.0	dBm	Average power coupled into single-mode fiber
Receiver optical input power (BER $<10^{-12}$ with PRBS $2^7-1$ )	$P_{in}$	-28.0		-7.0	dBm	@ 2.12 Gbps, 140°F (60°C) case temp.
Receiver optical input wavelength	$\lambda_{in}$	1450		1620	Nm	
Transmitter extinction ratio	OMI	9			dB	
Dispersion penalty at 60 km				2	dB	
Dispersion penalty at 100 km				2	db	@ 1.25 Gbps
				3	dB	@ 2.12 Gbps

## Cisco DWDM SFP Transceivers

Main features of the Cisco DWDM SFP include:

- Support for International Telecommunication Union (ITU) 100-GHz wavelength grid
- Match for wavelength plan of Cisco 100-GHz ONS product family
- Fixed-wavelength SFP, with 40 different SFP models
- Hot-swappable input/output device that plugs into Gigabit Ethernet SFP ports or slots of a Cisco switch or router, linking the port with the network

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Table B-22 lists the DWDM SFP transceivers available through Cisco Systems. These SFP transceivers are supported by the Cisco MDS 9140 and Cisco MDS 9120 Switch.

**Table B-22 Cisco DWDM SFP Transceivers**

Part Number	Description
DWDM-SFP-6061=	Cisco 1560.61 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5979=	Cisco 1559.79 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5898=	Cisco 1558.98 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5817=	Cisco 1558.17 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5655=	Cisco 1556.55 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5575=	Cisco 1555.75 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5494=	Cisco 1554.94 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5413=	Cisco 1554.13 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5252=	Cisco 1552.52 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5172=	Cisco 1551.72 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5092=	Cisco 1550.92 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5012=	Cisco 1550.12 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4851=	Cisco 1548.51 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4772=	Cisco 1547.72 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4692=	Cisco 1546.92 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4612=	Cisco 1546.12 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4453=	Cisco 1544.53 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4373=	Cisco 1543.73 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4294=	Cisco 1542.94 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare

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**Table B-22 Cisco DWDM SFP Transceivers**

Part Number	Description
DWDM-SFP-4214=	Cisco 1542.14 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4056=	Cisco 1540.56 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3977=	Cisco 1539.77 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3898=	Cisco 1538.98 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3819=	Cisco 1538.19 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3661=	Cisco 1536.61 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3582=	Cisco 1535.82 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3504=	Cisco 1535.04 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3425=	Cisco 1534.25 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3268=	Cisco 1532.68 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3190=	Cisco 1531.90 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3112=	Cisco 1531.12 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3033=	Cisco 1530.33 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare

## Performance

- Supported protocols: Gigabit Ethernet, Fibre Channel 1 Gbps and 2 Gbps.
- Optical link budget of 28 db

## Connectors and Cabling

- Equipment: Standard SFP interface network. Dual LC/PC connector.



### Note

Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported

All cables and cable assemblies used must be compliant with the standards specified in the standards section.



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## Environmental and Electrical Specifications for Cisco DWDM SFP Transceivers

Table B-23 provides the environmental specifications for DWDM SFP transceivers.

**Table B-23** Environmental Specifications for Cisco DWDM SFP Transceivers

Description	Specification
Temperature, ambient operating	32 to 158°F (0 and 70°C)
Temperature, ambient nonoperating and storage	-40 to 185°F (-40 to 85°C)

Table B-24 provides the electrical specifications for DWDM SFP transceivers.

**Table B-24** Electrical Specifications for Cisco DWDM SFP Transceivers

Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Current	$I_s$		220	300	mA
Surge Current	$I_{surge}$			+30	mA
Input voltage	Vcc	3.1	3.3	3.5	V

## Optical Specifications for Cisco DWDM SFP Transceivers

Table B-25 provides the optical specifications for DWDM SFP transceivers. DWDM SFP transceivers have an optical link budget of 28 decibels (db).



Note

The parameters are specified over temperature and at end of life, unless otherwise noted.

**Table B-25** Optical Specifications for Cisco DWDM SFP Transceivers

Parameter	Symbol	Min.	Typical	Max.	Units	Notes
<b>Transmitter</b>						
Spectral Width				0.2	nm	Full width, -20dB from maximum, with resolution bandwidth (RBW) = 0.01 nm
Transmitter Center Wavelength		x - 100	x	x + 100	pm	
Side-Mode Suppression Ratio	SMSR	30			dB	
Transmitter Extinction Ratio	OMI	8.2			dB	

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**Table B-25** Optical Specifications for Cisco DWDM SFP Transceivers (continued)

Parameter	Symbol	Min.	Typical	Max.	Units	Notes
Transmitter Optical Output Power	P <sub>out</sub>	0		4.0	dBm	Average power coupled into single-mode fiber

#### Receiver

Receiver Optical Input Wavelength		1530		1565	nm	
Receiver Damage Threshold				+5	dBm	

#### Power-Limited Performance at OSNR of 20 dB (1 GbE or 1-Gbps FC) or 21 dB (2 Gbps FC) at 0.1-nm RBW

Optical Input Power	P <sub>in</sub>	-28.0		-9.0	dBm	
Dispersion Power Penalty < 1 GbE and 1 Gbps FC				3	dB	-800/+3600 ps/nm
Dispersion Power Penalty > 2 Gbps FC				3	dB	-800/+2400 ps/nm

#### Noise-Limited Performance at OSNR of 19 dB 1 GbE or 1 Gbps FC) or 20 dB (2 Gbps FC) at 0.1-nm RBW

Optical Input Power	P <sub>in</sub>	-22.0		-9.0	dB	
Dispersion OSNR Penalty < 1 GbE and 1 Gbps FC				2	dB	-800/+3600 ps/nm
Dispersion OSNR Penalty > 2 Gbps FC				3		-800/+2400 ps/nm



#### Note

- OSNR is measured at 0.1nm resolution bandwidth.
- Receiver performance is always specified for a BER < 10e-12



#### Note

When shorter distances of single-mode transceivers are used, it might be necessary to insert an optical attenuator in the link. At least 1 dB of attenuation is required to prevent damaging the optical receiver, and at least 9 dB of attenuation are required to avoid receiver overloading conditions.

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## X2 Transceiver Specifications

The Cisco MDS 9134 Switch is compatible with X2 transceivers and cables that have SC connectors. Each transceiver must match the transceiver on the other end of the cable in terms of wavelength, and the cable must not exceed the stipulated cable length for reliable communications.

Use only Cisco X2 transceivers with the Cisco MDS 9134 Switch. Each Cisco X2 transceiver is encoded with model information that enables the switch to verify that the SFP transceiver meets the requirements for the switch.

For details of X2 transceivers see the data sheet at the following location:

[http://www.cisco.com/en/US/prod/collateral/ps4159/ps6409/ps4358/product\\_data\\_sheet09186a00801bc698.html](http://www.cisco.com/en/US/prod/collateral/ps4159/ps6409/ps4358/product_data_sheet09186a00801bc698.html)

For information about safety, regulatory, and standards compliance, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

**Table B-26** lists the 10-Gigabit/Ethernet X2 transceiver modules available through Cisco.

**Table B-26 10-Gigabit X2 Transceiver Modules**

X2 Transceiver Module Product Number	Description
DS-X2-FC10G-SR	Cisco 10GFC-SR X2 transceiver module for MMF, dual SC connector
DS-X2-FC10G-LR	Cisco 10GFC-LR X2 transceiver module for SMF, dual SC connector
DS-X2-FC10G-ER	Cisco 10GFC-ER X2 transceiver module for SMF, dual SC connector
DS-X2-FC10G-CX4	Cisco 10GFC-CX4 X2 copper transceiver module, CX4 connector

**Table B-27** lists the port cabling specifications for the 10-Gigabit X2 transceiver modules. **Table B-28** lists the X2 transceiver optical transmit and receive specifications.

**Table B-27 X2 Transceiver Port Cabling Specifications**

X2 Product Number	Wavelength (nm)	Cable Type	Core Size (microns)	Modal Bandwidth (MHz/km)	Maximum Cabling Distance
DS-X2-FC10G-SR	850	MMF	62.5	160	26 m (85.3 ft.)
			62.5	200	33 m (108.3 ft.)
			50.0	400	66 m (216.5 ft.)
			50.0	500	82 m (269 ft.)
			50.0	2000	300 m (984.3 ft.)
DS-X2-FC10G-LR	1310	SMF	G.652 fiber	—	10 km (6.21 miles)
DS-X2-FC10G-ER	1550	SMF	G.652 fiber	—	40 km (24.8 miles)
DS-X2-FC10G-CX4	Copper	CX4	Copper	—	15 m (49.2 ft.)

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**Table B-28** X2 Transceiver Optical Transmit and Receive Specifications

X2 Product Number	Transceiver Type	Transmit Power (dBm)	Receive Power (dBm)	Transmit and Receive Wavelength (nm)
DS-X2-FC10G-SR	10GFC-SR, 850-nm MMF	— (Max) -7.3 (Min)	-1.0 (Max) -9.9 (Min)	840 to 860
DS-X2-FC10G-LR	10GFC-LR, 1310-nm SMF	0.5 (Max) -8.2 (Min)	0.5 (Max) -14.4 (Min)	1260 to 1355
DS-X2-FC10G-ER	10GFC-ER, 1550-nm SMF	4.0 (Max) -4.7 (Min)	-1.0 (Max) -15.8 (Min)	1550
DS-X2-FC10G-CX4	10GFC-CX4, Copper	—	—	—

## Cisco 10-Gbps Ethernet X2 Transceivers

Table B-29 lists the Cisco 10-Gbps Ethernet X2 transceivers.

**Table B-29** Cisco 10-Gbps Ethernet X2 Transceivers

Transceiver Module Product Number	Description	Type
DS-X2-E10G-SR	10-Gbps Ethernet Short Reach, X2, SC	Short reach

## General Specification for Cisco 10-Gbps Ethernet X2 Transceivers

Table B-30 provides the general specifications for Cisco 10-Gbps Ethernet X2 transceivers.

**Table B-30** General Specifications for the Cisco 10-Gbps Ethernet X2 Transceivers

X2	Wavelength (nanometer)	Fiber Type	Core Size (micon)	Baud Rate (GBd)	Cable Distance
DS-X2-E10G-SR	850	MMF	62.5	10.3125	33 (108 ft)
			50.0 (OM3)	10.3125	300 (984 ft)



**Note**

The minimum cable distance for the MMF transceiver listed above is 2 meters (6.5 feet).

## Environmental and Power Requirements Specifications for Cisco 10-Gbps Ethernet X2 Transceiver

Table B-31 provides the power requirement specifications for the Cisco 10-Gbps Ethernet X2 transceiver.

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**Table B-31** *Optical Transmit and Receive Specifications for Cisco 10-Gbps Ethernet X2 Transceivers*

X2	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dBm)
	Maximum	Minimum	Maximum	Minimum	
DS-X2-E10G-SR	-1.2	-7.3	-1.0	-9.9	2.6 (50.0 micron-OM3)

Table B-32 provides the environmental specifications for the Cisco 10-Gbps Ethernet X2 transceivers.

**Table B-32** *Environmental Specifications for Cisco 10-Gbps Ethernet X2 Transceiver*

X2	Operating		Storage	
	Maximum	Minimum	Maximum	Minimum
DS-X2-E10G-SR	40°C	0°C	85°C	-40°C

For information about safety, regulatory, and standards compliance, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

## Cisco 10-Gbps Ethernet DWDM X2 Transceiver

The Cisco 10-Gbps Ethernet DWDM X2 Transceiver pluggable module (DWDM-X2-xx.xx=) provides high-performance Fibre Channel connectivity for the Cisco MDS 9000 family 10-Gbps Fibre Channel switching module to an existing Ethernet DWDM infrastructure. The data format transmitted by the Ethernet DWDM X2 transceiver on the fiber is identical to that transmitted by the Fibre Channel X2 transceiver, except that the Fibre Channel packets are clocked at the 10-Gigabit Ethernet rate.

The main features of the Cisco 10-Gbps Ethernet DWDM X2 Transceiver include:

- Support for 32 nontunable ITU 100-GHz wavelengths compatible with the Cisco ONS DWDM channel plan.
- Support for digital optical monitoring capability.

For more information, refer to the data sheet at:

<http://www.cisco.com/en/US/products/ps6576/index.html>

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## Cable and Port Specifications

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This appendix includes the cables and connectors used with the Cisco MDS 9100 Series Fixed Configuration Fabric Switch, and it includes the following sections:

- [Cables and Adapters, page C-1](#)
- [Console Port, page C-2](#)
- [MGMT 10/100 Ethernet Port, page C-3](#)
- [Supported Power Cords and Plugs, page C-4](#)



**Caution**

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We strongly recommend that power cable runs and other potential noise sources be located as far away as practical from network cabling that terminates on Cisco equipment. In situations where long parallel cable runs exist but cannot be separated by at least 3.3 ft. (1 m), we recommend that you shield these potential noise sources. To avoid interference, the source should be shielded by housing it in a grounded metallic conduit.

---

## Cables and Adapters

The Cisco MDS 9100 Series accessory kit includes the following:

- RJ-45 to RJ-45 rollover cable
- RJ-45 to DB-9 female DTE adapter (labeled “Terminal”)
- RJ-45 to DB-25 female DTE adapter (labeled “Terminal”)
- RJ-45 to DB-25 male DCE adapter (labeled “Modem”)



**Note**

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Additional cables and adapters can be ordered from your customer service representative.

---



**Note**

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If you purchased this product through a Cisco reseller, contact the reseller directly for technical support. If you purchased this product directly from Cisco, contact Cisco Technical Support at this URL: <http://www.cisco.com/cisco/web/support/index.html>.

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## Console Port

The console port is an asynchronous RS-232 serial port with an RJ-45 connector. You can use the RJ-45 to RJ-45 rollover cable and the RJ-45 to DB-9 female adapter or the RJ-45 to DB-25 female DTE adapter (depending on your computer serial port) to connect the console port to a computer running terminal emulation software.

## Console Port Pinouts

[Table C-1](#) lists the pinouts for the console port on the Cisco MDS 9100 Series.

**Table C-1 Console Port Pinouts**

Pin	Signal
1 <sup>1</sup>	RTS
2	DTR
3	TxD
4	GND
5	GND
6	RxD
7	DSR
8	CTS

1. Pin 1 is connected internally to pin 8.

## Connecting the Console Port to a Computer Using the DB-25 Adapter

You can use the RJ-45 to RJ-45 rollover cable and RJ-45 to DB-25 female DTE adapter (labeled “Terminal”) to connect the console port to a computer running terminal emulation software. [Table C-2](#) lists the pinouts for the console port, the RJ-45 to RJ-45 rollover cable, and the RJ-45 to DB-25 female DTE adapter.

**Table C-2 Port Mode Signaling and Pinouts with DB-25 Adapter**

Console Port	RJ-45 to RJ-45 Rollover Cable		RJ-45 to DB-25 Terminal Adapter	Console Device
	RJ-45 Pin	RJ-45 Pin	DB-25 Pin	Signal
RTS	1	8	5	CTS
DTR	2	7	6	DSR
TxD	3	6	3	RxD
GND	4	5	7	GND
GND	5	4	7	GND
RxD	6	3	2	TxD



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**Table C-2** Port Mode Signaling and Pinouts with DB-25 Adapter (continued)

Console Port	RJ-45 to RJ-45 Rollover Cable		RJ-45 to DB-25 Terminal Adapter	Console Device
Signal	RJ-45 Pin	RJ-45 Pin	DB-25 Pin	Signal
DSR	7	2	20	DTR
CTS	8	1	4	RTS

## Connecting the Console Port to a Computer Using the DB-9 Adapter

You can use the RJ-45 to RJ-45 rollover cable and RJ-45 to DB-9 female DTE adapter (labeled “Terminal”) to connect the console port to a computer running terminal emulation software. [Table C-3](#) lists the pinouts for the console port, the RJ-45 to RJ-45 rollover cable, and the RJ-45 to DB-9 female DTE adapter.

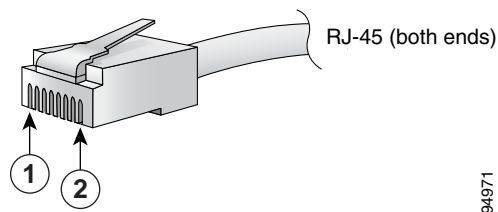
**Table C-3** Port Mode Signaling and Pinouts with DB-9 Adapter

Console Port	RJ-45 to RJ-45 Rollover Cable		RJ-45 to DB-9 Terminal Adapter	Console Device
Signal	RJ-45 Pins	RJ-45 Pin	DB-9 Pin	Signal
RTS	1	8	8	CTS
DTR	2	7	6	DSR
TxD	3	6	2	RxD
GND	4	5	5	GND
GND	5	4	5	GND
RxD	6	3	3	TxD
DSR	7	2	4	DTR
CTS	8	1	7	RTS

## MGMT 10/100 Ethernet Port

Use a modular, RJ-45, straight-through UTP cable to connect the 10/100 management Ethernet port to external hubs and switches. To connect to a router, use a crossover cable. (See [Figure C-1](#).)

**Figure C-1** RJ-45 Interface Cable Connector



1	Pin 1	2	Pin 8
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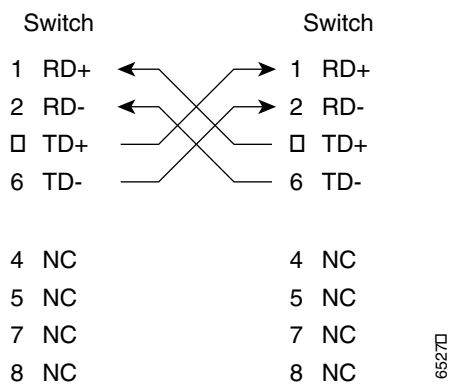
Table C-4 lists the connector pinouts and signal names for a 10/100BASE-T management port (MDI) cable.

**Table C-4** 10/100BASE-T Management Port Cable Pinout

Pin	Signal
1	TD+
2	TD-
3	RD+
6	RD-
4	Not used
5	Not used
7	Not used
8	Not used

Figure C-2 shows a schematic of the 10/100BASE-T cable.

**Figure C-2** Twisted-Pair 10/100BASE-T Cable Schematic



## Supported Power Cords and Plugs

A separate power cord is provided for each power supply. Standard power cords or jumper power cords are available for connection to a power distribution unit having IEC 60320 C13 outlet receptacles. The jumper power cords, for use in cabinets, are available as an option instead of the standard power cords.

### Power Cords

The standard power cords have an IEC C15 connector on the end that plugs into the switch. The optional jumper power cords have an IEC C15 connector on the end that plugs into the switch, and an IEC C14 connector on the end that plugs into an IEC C13 outlet receptacle.

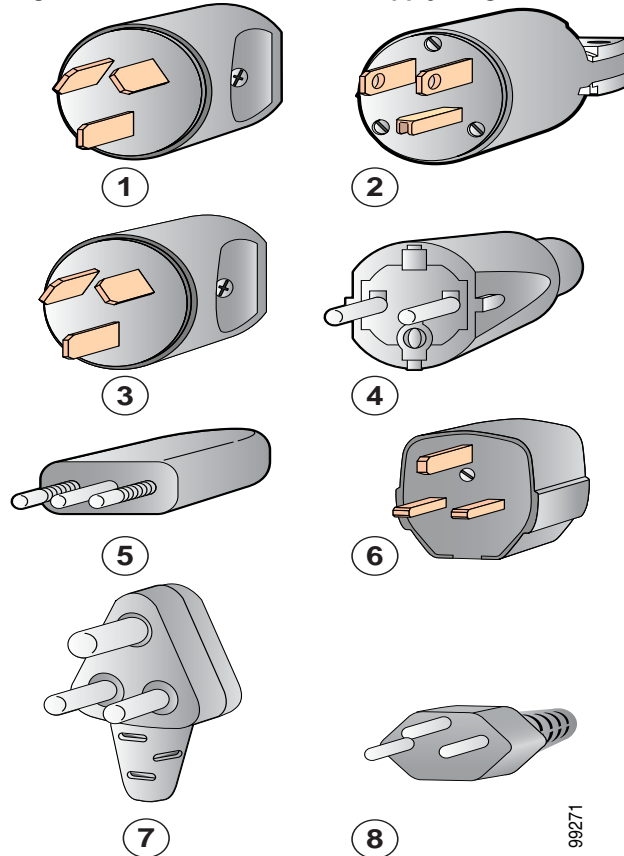
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**Note** Only the standard power cords or jumper power cords provided with the switch are supported.

Figure C-3 shows the supported plugs for the Cisco MDS 9100 Series power supplies.

**Figure C-3 300-W Power Supply Plugs**



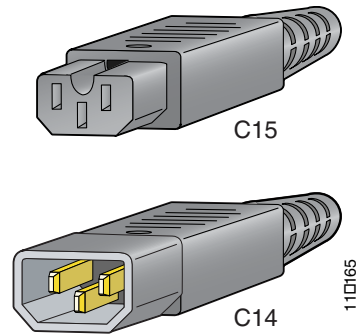
1	Argentina, IRAM 2073 plug (10 A)	5	Italy 1/3G plug, CEI 23-16 (10 A)
2	North America NEMA 5-15P plug (15 A)	6	United Kingdom BS89/13, BS 1363/A (13 A; replaceable fuse)
3	Australia, New Zealand SAA/3 plug, AS/NZS 3112-1993 (10 A)	7	South Africa EL 208, SABS 164-1 (10 A)
4	Europe VIIG Plug, CEE (7) VII (16 A)	8	Switzerland 12G SEV 1011 (10 A)

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## Jumper Power Cord

Figure C-4 shows the C14 and C15 connectors on the optional jumper power cord for the Cisco MDS 9100 Series switch. The C15 connector connects into the C14 inlet on the Cisco MDS 9100 Series power supply, while the C14 connector connects into the C13 receptacle of a power distribution unit for a cabinet.

**Figure C-4** Connectors on Jumper Power Cord for Cisco MDS 9100 Series





## APPENDIX D

# Site Planning and Maintenance Records

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This appendix includes a site planning checklist and maintenance records to use when installing the Cisco MDS 9100 Series Fixed Configuration Fabric Switch, and it includes the following sections:

- [Site Preparation Checklist, page D-1](#)
- [Contact and Site Information, page D-3](#)
- [Chassis and Network Information, page D-4](#)



**Note**

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For information about how to query the switch for configuration information, see the *Cisco NX-OS Fundamentals Configuration Guide* and the *Cisco Fabric Manager Fundamentals Configuration Guide*.

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## Site Preparation Checklist

Planning the location and layout of your equipment rack or wiring closet is essential for successful switch operation, ventilation, and accessibility. [Table D-1](#) lists the site planning tasks that we recommend completing before installing the Cisco MDS 9100 Series switch.

Consider heat dissipation when sizing the air-conditioning requirements for an installation. See [Table B-1](#) for environmental requirements and [Table B-5](#) for power and heat ratings.

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**Table D-1 Site Planning Checklist**

Task No.	Planning Activity	Verified By	Time	Date
1	Space evaluation: <ul style="list-style-type: none"> <li>• Space and layout</li> <li>• Floor covering</li> <li>• Impact and vibration</li> <li>• Lighting</li> <li>• Maintenance access</li> </ul>			
2	Environmental evaluation: <ul style="list-style-type: none"> <li>• Ambient temperature</li> <li>• Humidity</li> <li>• Altitude</li> <li>• Atmospheric contamination</li> <li>• Air flow</li> </ul>			
3	Power evaluation: <ul style="list-style-type: none"> <li>• Input power type</li> <li>• Power receptacles<sup>1</sup></li> <li>• Receptacle proximity to the equipment</li> <li>• Dedicated circuit for power supply</li> <li>• Dedicated (separate) circuits for redundant power supplies</li> <li>• UPS<sup>2</sup> for power failures</li> </ul>			
4	Grounding evaluation: <ul style="list-style-type: none"> <li>• Circuit breaker size</li> <li>• CO ground (AC- powered systems)</li> </ul>			
5	Cable and interface equipment evaluation: <ul style="list-style-type: none"> <li>• Cable type</li> <li>• Connector type</li> <li>• Cable distance limitations</li> <li>• Interface equipment (transceivers)</li> </ul>			
6	Electromagnetic interference (EMI) evaluation: <ul style="list-style-type: none"> <li>• Distance limitations for signaling</li> <li>• Site wiring</li> <li>• RFI<sup>3</sup> levels</li> </ul>			

1. Verify that the power supply installed in the chassis has a dedicated AC source circuit.

2. UPS = uninterruptible power supply.

3. RFI = radio frequency interference.

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## Contact and Site Information

Use the following worksheet to record contact and site information.

**Table D-2**      *Contact and Site Information*

Contact person	
Contact phone	
Contact E-Mail	
Building/site name	
Data center location	
Floor location	
Address (line 1)	
Address (line 2)	
City	
State	
Zip code	
Country	

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## Chassis and Network Information

Use the following worksheets to record chassis and network information.

**Contract Number** \_\_\_\_\_

**Chassis Serial Number** \_\_\_\_\_

**Product Number** \_\_\_\_\_

*Table D-3 Network-Related Information*

Switch IP address	
Switch IP netmask	
Host name	
Domain name	
IP broadcast address	
Gateway/router address	
DNS address	
Modem telephone number	





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See also AC-input power supplies

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*Send documentation comments to [mdsfeedback-doc@cisco.com](mailto:mdsfeedback-doc@cisco.com)*